Chemical Age

D.S.I.R. SPENDING ON RESEARCH TO BE DOUBLED
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CHEMICAL AGE

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$CaCl_2$ SHORTAGE

THERE is a shortage of calcium chloride in the U.K. What is more, this shortage has occurred, by all accounts, rather suddenly. Suppliers of this inorganic are Imperial Chemical Industries Ltd., who are believed to produce it as a by-product from their ammonia-soda (Solway) process.

At the present time it is understood that I.C.I. have met with manufacturing difficulties, such as corrosion and descaling problems in their plant. Also, output appears to be insufficient to meet present demands.

Because of the supply position it is anticipated that by 1 January, 1959, price increases will be announced. The price quoted today varies from £13 5s for solid (70-75%) per ton in drum lots to about £17 per ton for flake or solid.

More calcium chloride is now being imported—mostly in the form of flake which is more expensive. From informaton avalable it appears that in some instances U.K. companies have been offered the material at almost double the U.K. price.

A recent Board of Trade order extending to 31 December has exempted from import duty the ordinary grade from duty of 20%. Examination of the imports of calcium chloride shows that none was imported in March and April this year, while the total to October this year is just under 3,000 cwt. Exports during the same period, however, totalled 126,256 cwt. Imports over the two previous years 1956 and 1957 are noted as having decreased in amount from 29,279 cwt. in 1956 to 4,315 cwt. in 1957, while imports over the same period have shown a steady rise (84,611 cwt. in 1956; 102,755 cwt. in 1957).

What does all this add up to? First, the supply position. Obviously this is not in a happy state at the moment. There are suggestions that the shortage may have occurred with a changeover in the method of production of calcium chloride. Having regard to the amount of this product that this country has been exporting, and the small amount imported particularly during this year, this seems a likely explanation. How long the shortage will persist and whether present capacity will be adequate having regard to a rising demand for this product are questions which cannot be answered at the present time.

It is not known how much calcium chloride is produced in the U.K. and it is uncertain which method of manufacture is used to produce it. It can be obtained as a by-product in the waste liquor of the ammonia-soda (Solway) process. The clear solution contains calcium chloride, sodium chloride and a small amount of dissolved calcium sulphate.

Calcium chloride can also be obtained as a joint product from natural salt brines. The brine is generally treated to recover bromine and sodium chloride and after this treatment is rich in calcium and magnesium chlorides (about 3-to-1 ratio). It may be concentrated to yield a calcium-magnesium chloride mixture. As such this product is suitable for such uses as dust control. The magnesium chloride is removed by treating the liquor with lime when magnesium hydroxide precipitates out.

The calcium chloride containing liquors after purification of the natural brines and from the Solway process are concentrated and crystallised. Calcium chloride solutions, used as cooling brines and antifreeze solutions are withdrawn at various steps in the evaporation (concentration) process depending on the specific gravity desired.

Is the shortage due not only to a breakdown in supply, but also to demand? It is difficult to determine at this stage what is the usage of calcium chloride and even what its major application might be in the U.K.

In the U.S. calcium chloride production has increased from 373,602 short tons solid and flake in 1947 to 565,000 short tons in 1957. This is due to the increased usage of calcium chloride for road stabilisation and dust laying, which is stated to take 60% of U.S. production. The U.S. federal highways scheme is also an important factor, for calcium chloride is being used in concrete paving and for bridges. Curing concrete with calcium chloride is very much in vogue in the U.S. and is now estimated to account for 15% of annual consumption of this chemical. Other uses for the salt are in coal treatment (10-15%), refrigeration (5%), fire protection and miscellaneous uses.

Chemical Age wishes a Prosperous New Year to all its Readers

A check in this country reveals that probably the greatest usage of calcium chloride is in curing concrete and in ready mixed cements such as 417 cement (Cement Marketing Co.). Mixed with cement as 2% of the weight of cement, it accelerates the chemical reaction and serves to give the cement strength. Its specific use is in frosty weather, when because of the heat of the reaction produced, the concrete is unaffected by frost.

It is believed that the present modern trend of construction companies to continue concreting during frosty spells is part of the cause of the present shortage. The present requirements due to bridge building and possibly to new roads may be other contributory factors in increasing the demand for calcium chloride. But there is as yet no indication that concrete for road-making purposes is gaining favour in this country.

Purchasers are obviously concerned about the shortage, and are checking various sections of the chemical industry for other sources of supply. Those companies who can supply or who are willing with very little extra effort to produce calcium chloride are going to find quite a few customers.

In order to clarify the position CHEMICAL AGE has contacted I.C.I., from whom it is learned that I.C.I. have supplied the home trade during 1958 with almost identical quantities to those supplied in 1957 and are currently supplying at a higher rate than in 1957. Difficulties however, in installing their extended capacity for calcium chloride coupled with an abnormally high home trade, I.C.I. state, have created temporary delays in despatch. The company are hopeful, nevertheless, that the extension will be in operation very shortly and that supplies will be freely available.

Because exports represent a small proportion of I.C.I. sales and because it is necessary for the future to provide continuity of supplies, I.C.I. have recently made certain imports of calcium chloride which have been sold at a loss, since home trade prices are lower than those prevailing elsewhere in Europe. The company are confident, however, that they can meet the full needs of the home trade if all their customers will confine their orders to their current actual needs and not attempt to build up stocks.

POLYPROPYLENE STATEMENT

FOLLOWING the claims made by the Montecatini Company of Italy on polypropylene (CHEMICAL AGE 13 December, p. 980), the company and Professor Karl Ziegler, director of the Max Planck Institute, Mulheim, Ruhr, Germany, have now released a joint statement which is intended to complete the statement made by Dr. Bartolomeo Orsoni.

According to an existing Montecatini-Ziegler agreement, Ziegler, the statement indicates, has exclusive rights on polypropylene in Germany and Montecatini have exclusive rights on polypropylene in Italy. Montecatini's and Ziegler's patent rights outside Italy and Germany are licensed by Montecatini according to said Montecatini-Ziegler agreement.

Montecatini negotiate patent licenses taking into consideration Ziegler's wishes, final decisions being reserved to Montecatini, who retain the major share of the returns.

This agreement was reached after the following developments had taken place : Montecatini became in January 1953 one of the earliest licensees of Ziegler's pioneer developments on organometallic catalysts. Ziegler's 1953 invention of new complex organometallic catalysts and of the possibility of polymerising ethylene to high polymers with the aid of them was disclosed to Montecatini in December 1953. Shortly after this disclosure, Professor Guilio Natta, Montecatini's consultant, working with Ziegler-type catalysts, succeeded in discovering sterically differentiated polypropylenes and somewhat later he discovered stereospecific catalysts and invented his stereospecific propylene polymerisation processes.

Hercules and the four other U.S. companies which have acquired licenses from Ziegler prior to the Montecatini-Ziegler agreement (which licenses do not entail any rights on Montecatini's patent rights) have not yet acquired Montecatini's patent rights on polypropylene.

U.S. FLUOROCARBON CAPACITY

THERE will soon be four competitors in fluorocarbon gases in the U.S. At present there are Du Pont (280 million lb. annually), General Chemical (85 million lb.), and Pennsalt (50 million lb.). Due in this month is Union Carbide's new fluorinated hydrocarbon plant with a 50 million lb. capacity a year.

U.S. capacity will therefore be about 100% ahead of demand and a Du Pont spokesman has suggested that none of the producers will be operating at more than 50% of plant capacity. Sales for this year have been forecast at 200 million lb. and next year's estimates suggest a 3 to 4% increase. Despite these facts, however, Union Carbide are going ahead with their plans. They realise that there will be problems in fluorocarbons, but have in mind a major move into fluorochemicals. Several fluorochemicals now in various research and development stages are expected to have applications as surface-active agents, polymers, insecticides, lubricants, etc.

Aerosol propellants or refrigeration agents in the U.S. consume about 90% of present fluorocarbon production but are now regarded as having reached peak levels. Also competition from nitrogen and butane is increasing. The amount of propellant used per container is stated to be decreasing and continued improvements in refrigerator design are leading to less refrigerant being used. Certainly present demands will not use up today's capacity.

Research indicates that fluorocarbons might be used as foaming agents for urethanes instead of the now used water-isocyanate combinations. Fluorocarbon intermediates and products thereof may also lead to larger fluorocarbon demands.

D.S.I.R. Spending on Research to be Doubled to £61m.

MONEY spent on research by the Department of Scientific and Industrial Research will be nearly doubled in the next five years. Under its second five-year plan (1959-64) about £61 million will be made available, compared with £36 million for the first period which ends on 31 March, 1959. This was announced in the House of Commons last week by Mr. Harmar Nicholls, Parliamentary Secretary, Ministry of Works, speaking on behalf of Lord Hailsham, Lord President of the Council, the Minister responsible for D.S.I.R.

Expansion will continue steadily throughout the period and for 1963-64 expenditure is planned to reach about £14 million. This figure does not include certain items, the largest of which is the British contribution to the European Organisation for Nuclear Research which will continue to be financed outside the five-year plan.

The largest expansion is planned to take place in the field of scientific grants to the universities. Post-graduate awards to students will be increased by about 10% each year until in 1963-64, it is hoped, some 3,800 students will be receiving D.S.I.R. grants for research training. In the same year it is expected that D.S.I.R. support for special research in the research departments of universities will be operating on a scale of about £1¼ million per annum.

Expansion of Staff

In support of additional research carried out in the department's own laboratories, expansion of staff at the rate of about 6% per year—or about 30% over the five years—is included in the plan.

Grants to the research associations will also be increased to over £2 million a year by the end of the period. At present there are 49 organisations in the D.S.I.R. scheme. The Council for Scientific and Industrial Research will continue its policy of encouraging industry to bear an increasing proportion of the total cost. It may be expected, therefore, that the actual expansion of the R.A. movement will be proportionately greater than the increase in Government grant.

It has also been decided to devote much more attention and more money to ensure that the results of scientific research are known and applied.

It is also proposed that the Ministry of Works will increase its rate of expenditure on behalf of D.S.I.R. so as to provide buildings and equipment for the increased staff of D.S.I.R. laboratories. The works programme includes the provision of a new laboratory at Crowthorne, Berks, to rehouse the Road Research Laboratory which now occupies two separate sites a few miles apart, one at Harmondsworth, Middlesex, and the other at Langley, Bucks.

Speaking in the House, Mr. Nicholls said that on a broad front Britain could produce a fairly impressive list of the results of scientific research. There was the pure and applied research on the atom; the brilliant work of British chemists which had brought three Nobel prizes to the U.K. in the last three years; the development of the electronic computer; and the new knowledge obtained for the chemical control of weeds.

Some 20,000 firms were members of various research associations. They planned to spend about £7 million in 1957-58, of which £1,750,000 would be contributed by the D.S.I.R. Under the next five-year plan that amount would be increased to £2 million. Government grants were made in proportion to contributions from industry.

Never before had this country spent so much on new buildings for universities and technical colleges. This massive development plan aimed at doubling the output of scientists and engineers by 1970 in relation to 1955; in the first five years of the programme the output of qualified scientists and engineers had already risen from 11,000 to 13,000.

Mr. F. Willey (Sunderland, North) thought that a full-time chairman ought to be appointed for the D.S.I.R. He put the suggestion with no reflection on Sir Harry Jephcott, but felt they should try to increase the status and authority of the D.S.I.R. He felt that the D.S.I.R. had lost ground over the past few months.

M.P.'s Concerned at Decision to Disband D.S.I.R. Industrial Microbiology Unit

LORD HAILSHAM, Lord President of the Council, will be ready to answer any question from Members of Parliament by letter on the decision to disband the Microbiology Group at the National Chemical Laboratory, Teddington, if they write to him on the subject. This was stated in the House of Commons adjournment debate on 18 December in which Mr. W. Harmar Nicholls, announced the decision to double the Government grant to D.S.I.R.

Mr. F. Willey (Sunderland, North) raised the question stating that while he could not speak on the merits of the decision, one could certainly criticise the way in which it had been done, because there had been no consultation with the head of the group and no consultation, as far as he knew, with the important people in the field of microbiology.

He said 'This may detract from the driving power and feeling of purpose which ought to be behind this research.' He thought that all interested were somewhat disturbed by the way in which the decision had been taken. He hoped Lord Hailsham was aware of this.

Mr. Nicholls said that the decision was taken entirely on scientific merits and without any intervention by Lord Hailsham or any other Minister. It would be contrary to the spirit of the D.S.I.R. Act for a Minister to give a direction on a matter of this kind which was wholly within the scientific responsibility of the D.S.I.R. Research Council. Lord Hailsham was satisfied that the matter was given extremely careful thought by the Council before it came to the decision.

Mr. Arthur Skeffington (Hayes and Harlington) said that he found the Minister's remarks extremely disappointing. The whole scientific world realised the magnificent work which the microbiology unit had done. It was unique in character. It was felt that before 'this very valuable scientific adjunct is dispersed,' the Lord President of the Council should consider the matter, because there was widespread consternation and dismay about the decision.

It was felt among scientists that the decision had not been given the attention at the highest level which it deserved. He pleaded that even at this stage the Lord President should consider representations before the unit was disbanded.

Permutit Agreement on Desalting Plants

A LICENSING and royalty agreement signed by Ionics, Incorporated, Cambridge, Mass., U.S., and the Permutit Co. Ltd., London, is expected to speed the widespread application of membrane-type water desalting plants throughout the arid regions of the world. Permutit are one of the world's largest and oldest water treatment equipment organisations and become Ionic's licensee for the manufacture and sale throughout most of the British Commonwealth of ion exchange membranes and equipment covered by Ionics' British patents.

The electric ion transfer membrane method (electrodialysis) has been pioneered by Ionics, ante-dating similar overseas work. It is claimed to be the most economical for the purification of brackish waters containing from one-half to one-twentieth as much salt as sea water. Rapid advancements in membrane technology hold similar promise for large-scale desalting of sea water.

The agreement recognises alike the basic patent position of Ionics and the extensive manufacturing, sales and service facilities of Permutit throughout the British Commonwealth. Ionics will continue the manufacture of membranes and equipment for plants sold elsewhere in the world.

DISTILLATES

★ A VAST surplus capacity in the free world's nickel industry is disclosed by Dr. J. F. Thompson, chairman, International Co., of Canada, in his annual review of the industry. Free-world productive capacity in 1958, estimated at about 525 million lb. was almost double the pre-Korean conflict capacity. Total nickel consumption this year is expected to be between 325-335 million lb., compared with about 415 million lb. last year.

Principal reason for the decrease was the North American recession, which coincided with a period of heavy liquidation of stocks by consumers. In the U.K. and on the Continent the decrease in consumption was only slight. Dr. Thompson adds that the free-world nickel capacity is expected to rise to 550 million lb. in 1958, about 600 million lb. in 1960 and about 650 million lb. in 1961, the latter figure being about double the 1958 rate of consumption.

Consumption of chemical nickel, including that for catalysts, ceramics and nickel salts, during 1958 was substantially lower than in 1957 as a result of curtailed business activity. A nickel catalyst, essentially calcium-nickel-phosphate, is said to have played an important part in the expanded European petrochemical production of one variety of synthetic rubber, which was not named by Dr. Thompson.

★ EVIDENCE of what must be a potentially big market in South-East Europe for laboratory chemicals comes to me from Mr. Edward Gurr, director of Edward Gurr Ltd., 42 Upper Richmond Road West, London S.W.14, following his recent tour of the area. When inspecting a large Government medical institute, he was puzzled by the fact that although equipped with the most modern apparatus, he could not see a single bottle of any kind; there were no shelves to be seen and a glance inside the cupboards did not reveal any bottles of reagents either.

He was told 'You wish to see bottles, yes? Very well, I show you. You follow me.' His guide, a qualified medical man, was not joking. Quite seriously he took Mr. Gurr to a large room with benches all round the walls as well as in the centre and said 'There you see bottles.' He pointed to the largest assortment that Mr. Gurr had ever seen of wine bottles, sauce bottles, medicine bottles and many other different varieties, each containing samples of urine—presumably brought in by patients for test.

Mr. Gurr did not pursue the matter and although a large number of laboratory workers were examining microscopic specimens there was still no sign of any bottles of the reagents that must surely have been used. Perhaps the workers he saw were students, for after all, the distillation and/or evaporation to dryness of the substance ranks only second in importance to the preparation of gunpowder as the first step in practical chemistry—as most of my chemist readers will recall!

★ STILL further expansion in the fields of chemical and pharmaceutical production in India has been announced in Delhi, on one side through probable Russian assistance and on the other through U.S. aid. The first case is that of the pharmaceutical plant in which the Soviet Government is interested in seeing built in India. Primary negotiations have already taken place, and it is likely that the U.S.S.R. will offer credit totalling 80 million roubles when final negotiations begin in Moscow next month.

On the other side, talks are going on between India and the U.S. Technical Co-operative Mission as to the sum which the Mission grants to India as financial aid for the extension of the country's State-owned penicillin-producing plant at Pimpri, near Poona.

★ WHAT is believed to be the first large nuclear energy order placed in Britain by Belgium—and the first such order to be placed with I.C.I. by a nuclear organisation outside the U.K.—has been obtained by I.C.I. (Belgium) S.A., as agents for Marston Excelsior (both I.C.I. subsidiaries).

The order, worth just over £100,000, is for aluminium piping in connection with the experimental water-cooled reactor BR.2, now being erected at the nuclear research centre at Mol for Centre d'Etudes Nucleaires. It comprises piping and fittings in aluminium alloy, up to 30 in. diameter to connect the reactor shell to the heat exchangers and the exchangers to a cooling pond.

BR.2 is an advanced type of materials and engineering test reactor using uranium enriched to 90% U_{235} as fuel with metallic beryllium as the moderator. Marston Excelsior will carry out the site-welding as well as supervising erection by the Belgian firm 'Fabricon.'

★ TRIETHYLAMINE, other amine compounds and certain compounds of the ether family are among the substances being studied in the U.S. in a project on a process for producing fresh water from the sea. The ideal solvent for separating fresh water from brine must, of course, dissolve water efficiently and not pick up salt or other foreign matter in the brine.

The solvent must also have such solubility relations with water that it separates when the solution is subsequently heated in the range of 140 to 175°F. A number of other requirements are listed by Dr. A. Furman Isbell and his co-worker at the Agricultural and Mechanical College of Texas, Professor D. W. Wood. Their attempt to produce the solvent by chemical synthesis is sponsored by the U.S. Department of the Interior.

The other characteristics sought are low density; low viscosity; moderately low boiling point; and good selectivity against such materials as sodium, magnesium, calcium and chloride and sulphate ions. The solvent should also be chemically inactive with water and not too alkaline in nature; too much alkalinity would precipitate out magnesium from sea water and foul up the process.

These requirements naturally complicate the work and combinations of amines and ethers, namely N-alkylated morpholines, that were prepared did not precipitate magnesium from sea water; but they did not meet some of the other standards. It is hoped to reduce the alkalinity of amines by combining them with other compounds. Compounds synthesised, methods of preparations and tables of properties were given in a paper presented by Dr. Isbell at a recent meeting of the American Chemical Society and are available on application.

★ THERE will be keen dissatisfaction with Mr. W. Harmar Nicholls' remarks in the House last week when the fate of the N.C.L. Microbiological Group was mentioned in an adjournment debate on Government aid to D.I.S.R. Mr. Nicholls said that Lord Hailsham, Lord President of the Council, and the Minister responsible for D.S.I.R., was satisfied that the matter had been given extremely careful thought by the Research Council before it came to its decision.

Doubtless the Research Council did consider the matter; certainly its members could not have given it 'extremely careful thought', for had they taken the trouble to consult the head of the unit, the chairman of the advisory committee or any independent expert, they would have thought twice before making such an unfortunate decision. It is to be hoped that Lord Hailsham will do what the D.S.I.R. Research Council did not do and discuss the matter with someone who knows the true value of the work of this unit.

The cavalier manner in which the decision was taken is a strong reflection on the members of the council; it will sap the confidence of other specialised research units and of the advisory committees, which appear to have been rendered superfluous.

Alembic

B.S.A.F. REPORT HIGHER OUTPUT OF SULPHATE OF AMMONIA IN U.K.

PRODUCTION figures for 1957-58 show a 7.8% increase over the previous year for sulphate of ammonia and of 13.1% for other forms of nitrogen, reports the British Sulphate of Ammonia Federation Ltd. in their annual report for 1957-58. World production and consumption of nitrogen have again increased and the federation states that this trend is likely to continue.

Figures based on Board of Trade and nitrogen producers returns of deliveries against sales within the fertiliser year for the year 1957-58 show that there was an increase of 7,917 metric tons or 2.6% over 1956-57 deliveries, thus continuing the trend for the sixth successive fertiliser year. While changes in stocks held by farmers and trade buyers make the assessment of consumption in any one year difficult, it is estimated that nitrogen consumption in British agriculture increased in each of the last three fertiliser years, the total increase being of the order of 63,000 metric tons, or an average of 21,000 metric tons of nitrogen a year.

Decline in Nitrogen Deliveries Due to Stock Reductions

A sharp decline in nitrogen deliveries marked the end of the 1956-57 fertiliser yield, due to the decision of both farmers and trade buyers to reduce stocks. This caution in buying policy throughout the autumn and winter months of 1957 was enhanced after the increase in the bank rate to 7% in September. As a result, deliveries lagged behind the corresponding monthly deliveries for 1956-57 until the late spring of 1958. Heavy despatches in April and May, however, enabled record figures for nitrogen deliveries to be achieved for the season as a whole.

Total shipments of sulphate of ammonia from the U.K. are shown in the table below. The figures indicate that when it became apparent that with the increased production ample provision had been made for the home market, larger supplies became available for export. Compared with 1956-57 when 51,835 metric tons were exported, exports last year totalled 305,928.

In the 1957 Farm Price Review, it had been announced that increased production grants including extra subsidies on nitrogenous fertilisers would be paid in 1957-58. On 1 July 1957 the subsidy on sulphate of ammonia was accordingly increased from £6 15s 0d to £8 18s 6d per ton. The benefits of this increase, the Federation reports, were offset by the credit squeeze and for the greater part of the 1957-58 season it was difficult to detect any direct response by consumers to the reduction in the net cost of sulphate of ammonia which was lower than it had been for many years. It was when the bank rate was reduced to 6% in March this year that an increased demand for fertilisers arose.

Prices charged to British farmers per ton delivered in 6-ton lots to buyers' nearest station for neutral quality guaranteed to contain not less than 20.6% N (20.8% N) from 1 January 1956 were summer 1957-58 £20 2s and spring 1957-58 £21 8s. This shows little change from 1956-57 prices of £20 2s and £21 2s respectively.

Final average realisations receivable by members of the Federation per ton produced, based on sales realisations for all deliveries for home and export free on rail at makers' works in secondhand bags, after making allowances for adjustments in the value of unsold stock and provision against losses in certain markets was as follows:

	Ordinary quality 20.4% N	Neutral quality 21.1% N
1956-57	£15 4s 8d	£16 10s 0d
1957-58	£14 18s 4d	£16 3s 8d

The Federation notes that the production of ordinary quality has declined year by year during the past decade and the total output for the past three years has been: 1955-56, 133 tons; 1956-57, 154 tons; 1957-58, 51 tons.

Owing to centralisation schemes a number of small plants which regularly produced grade I salt were shut down during the year, but new plants built to the federation research department's recommended design and method of operation have been brought into service. The tonnage of grade I salt has thus been maintained at over 50% of the total product output.

Three More Plants to Produce Grade I Salt

Following the successful modification of several existing plants which has enabled them to produce grade I salt regularly, schemes are in hand, it is announced, for modifying a further three plants.

The new and modified plants have been visited by representatives of the by-product sulphate of ammonia industry from Belgium, Italy and Sweden, who have discussed design and method of operation with members of the Federation's research department with a view to application to their own plants.

Efforts have continued by the research department to reduce production costs by the introduction of special alloys and protective resin coatings to prevent corrosion and erosion. Promising results are being obtained, it is reported, with resin-based glass-laminate pipes. The automatic acidity controller has continued to work well on the semi-direct plant at which it is installed, and considerable progress has been made in the application of this principle to the indirect process.

WORLD PRODUCTION OF FIXED NITROGEN
(thousands of metric tons)

Production	1955-56	1956-57	1957-58
Sulphate of ammonia ...	2,638	2,722	2,934
Calcium cyanamide ...	328	384	330
Nitrate of soda ...	265	216	247
Nitrate of lime	335	357	358
Ammonium nitrate ...	792	879	1,027
Lime ammonium nitrate types	1,193	1,269	1,466
Ammonia and solutions as direct or indirect fertiliser	978	1,071	1,095
Urea (for fertiliser use)	212	342	406
Other forms of nitrogen	1,883	2,082	2,477
Total production ...	8,624	9,272	10,340
Increase % on prior year	8.3	7.5	11.5

CONSUMPTION OF FIXED NITROGEN
(thousands of metric tons)

	1955-56	1956-57	1957-58
World total (all forms)	8,344	9,160	10,040
Increase % on prior year	8.6	9.8	9.6
World total in agriculture	6,990	7,713	8,370
Increase % on prior year	8.8	10.3	8.5
For agricultural purposes:			
Europe (inc. U.S.S.R.)	3,416	3,777	4,046
Asia	1,399	1,514	1,750
Africa	198	210	254
Oceania (inc. Hawaii)	51	53	65
America	1,926	2,159	2,255

U.K. EXPORTS OF SULPHATE OF AMMONIA FERTILISER, YEAR ENDED 30 JUNE
(tons of 2,240 lb.)

To	1955-56	1956-57	1957-58
Scandinavia	216	267	282
Holland and Belgium	14	12	4
Portugal	—	—	5,820
Spain	—	—	29,528
Other Europe ...	451	700	700
Palestine/Israel ...	97	—	—
Other Levant	—	—	8,304
India, Pakistan and Burma	30,442	423	10
Ceylon	11,321	10,454	90,686
Malaya and Br. Borneo	14,680	7,653	53,411
Indonesia	1,201	—	—
China and Hong Kong	699	—	2,855
Other Asia	24	50	3,755
Madeira	—	—	—
Canary Islands ...	—	—	9,746
Egypt	76	3	—
Sudan	—	487	2,191
W. Africa	2,030	183	948
E. Africa	1,990	2,491	5,449
S. and Central Africa	2,226	2,803	2,552
Mauritius	14,479	5,698	21,548
Other Africa	10	5	10
Australia	9,700	—	20,848
N. Zealand	1,034	548	1,864
Fiji Isles	2,446	4,625	6,830
Canada and Newfoundland	436	309	266
U.S.A.	—	—	—
Central America ...	210	107	—
Br. West Indies ...	17,457	9,906	19,875
Br. Guiana	6,039	3,904	15,636
Other S. America ...	43	4	59
Total	117,321	50,632	303,177
Channel Islands ...	1,670	1,127	1,033
Eire	6,233	76	1,718
Total exported ...	125,224	51,835	305,928

U.K. PRODUCTION OF NITROGENOUS FERTILISERS*
(long tons)

Year	*England and Wales*	*Scotland*	*N. Ireland*	*Total*	*Of which sulphate of ammonia as such*
1955	1,269,500	164,700	1,100	1,435,300	1,010,700
1956	1,388,000	164,400	1,600	1,554,000	1,061,100
1957	1,459,300	180,500	1,800	1,641,600	1,109,500

* The first four tonnage columns show total production of nitrogenous fertilisers, expressed in terms of a standard material containing 25% ammonia = 20.6% nitrogen. Last column shows tons of sulphate of ammonia actually produced with a N content varying from 20.4% to 21.1% N.

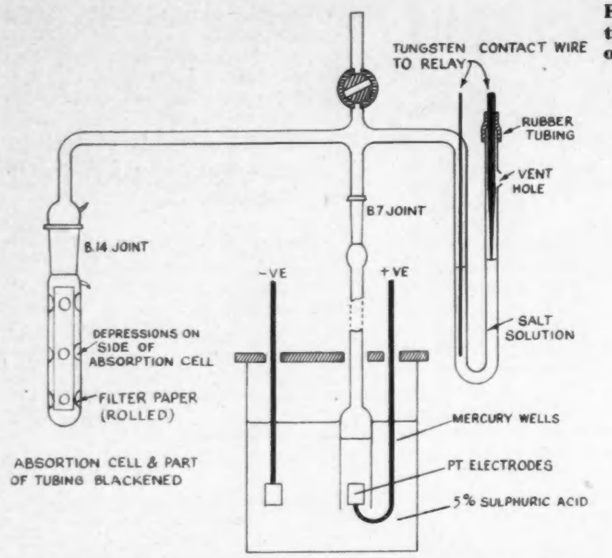


Fig. 1. Absorption cell, and oxygen generator

APPARATUS FOR STUDY OF OXIDATION RATE

By C. T. Cowan, Fullers' Earth Union Ltd.

IN ANY process where oxygen is continuously absorbed over a period of time in excess of eight hours, it is desirable to have continuous automatic observations made. The apparatus described was developed to study the rate of oxidation of non-drying vegetable oils at atmospheric pressure and various temperatures.

The apparatus consists of an absorption cell, oxygen generator (Fig. 1) and two recording devices (Fig. 2). The sample under test (0.1 g.) is dispersed on 25 sq. cm. of filter paper and placed in the absorption cell. The apparatus is flooded with oxygen (from a cylinder) and assembled. As oxidation proceeds the pressure within the system falls causing the salt solution manometer to operate the electronic relay which switches the current to the electrolysis cell, integrating counter and recorder. Oxygen liberated at the anode re-establishes the pressure, which, via the manometer and relay, breaks the circuit. The four volts to the counting device may directly operate a low-voltage motor coupled to a counter, or alternatively, a low-voltage relay which switches mains voltage to a servo motor coupled to a counter. The counting device allows an accurate measure of the total operating time of the electrolysis cell to be made, while the recorder indicates the individual periods of operation with respect to time.

Initially, mercury was used as manometer liquid, but this had two main disadvantages:

(1) A relatively large pressure change within the system was required to actuate the relay.

(2) The time of each 'on' period varied considerably; this is not so with salt solution and each period of cell operation appears to be of the same duration. This makes calibration of the instrument much easier.

In Fig. 2 below, two absorption cells feed into the same recorder, each cell giving a different peak height on the recorder chart.

Thanks are due to the directors of the Fullers' Earth Union Ltd. for permission to publish this work.

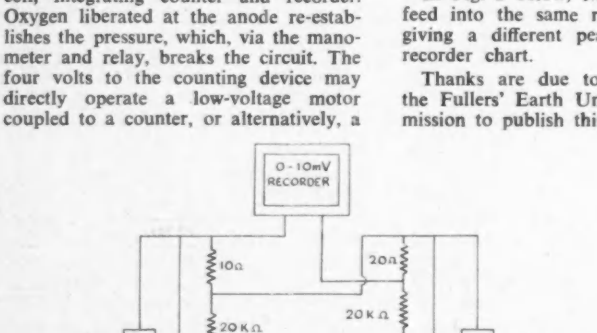


Fig. 2. Wiring plan for recording devices

Coating Metals, Glass, Plastics, etc., with Unikote Ceramics

A METHOD of applying coatings of Unikote ceramic materials onto steel, brass, copper, aluminium, etc., glass and even plastics, has been developed by UIC United Insulation Division of the Telegraph Condenser Co. Ltd., Oakcroft Road, Chessington, Surrey.

The ceramic materials available for coatings include Unilator, a gem-hard ceramic which can be made electrically insulating or conductive as required; Unilatum, a high-temperature, high-insulation ceramic also of gem-hardness; and Unilam, a heat and electrical insulator. All are stated to be resistant to wear, heat, moisture and chemicals. Other materials still being perfected include high permittivity dielectrics and piezo-electric ceramics.

For coating purposes, the ceramic material is specially prepared, then heated to a temperature in excess of 3,000°F and applied at high pressure to the part to be coated which is kept cool. The thickness of the coating can be made just a few thousandths of an inch or built up to 10mm., 20mm. or more.

Cost of the coatings is stated to be small compared with the cost of replacements they save and to be considerably less in many cases than the equivalent part in solid ceramic mould cost if it were possible to make it. Costs range from not more than 1 to 2 shillings for small parts to several pounds for large areas.

UIC will be offering shortly a range of standard parts and components and they are able to provide a service whereby ceramic coatings can be applied to parts supplied by customers.

New B.P. Research Unit for Petrochemicals

IN keeping with British Petroleum's increasing interest in petrochemicals, a new research unit which will specialise in this field is being formed at the group's research establishment at Sunbury-on-Thames, near London.

From the beginning of next year the Sunbury centre will be known as BP Research Centre and research will be handled by three Divisions. These will be:

Petroleum Division, which will carry out all the work handled until now by the research station, and as at present, it will be responsible to refineries and technical department in B.P.'s London office.

Exploration Division, until now called 'Exploration and production laboratory' which as at present will be responsible to exploration department.

Chemicals Division, the new unit which will carry out all petrochemicals research and will be responsible to B.P. Petroleum Chemicals Department.

The Research Centre will continue to be administered, to provide the services required by the divisions, by an administrative manager.

I.CHEM.E. PAPER ON LIQUID DISTRIBUTION IN GRID PACKINGS

Part I—Mechanism of Liquid Spread

ALTHOUGH the subject of liquid distribution in random-packed towers had received considerable attention, stated Dr. J. W. Mullin, Department of Chemical Engineering, University College, London, at the meeting of the Institution of Chemical Engineers in London on 17 December, no reliable method for the prediction of the degree of liquid spread had yet been devised. The problem had proved intractable because of the irregular arrangement of a random packing. In this paper, Dr. Mullin dealt with an experimental investigation of the liquid flow on single slats and grid packing elements. He also made a theoretical analysis of the results in an attempt to predict the liquid spread through grid packings in both normal and staggered arrangement.

Factors governing the spreading of a liquid in a grid packing are: dimensions of the slats; pitch of the slats in the grids; material of the slats; and, liquid flow rate.

Slat Thicknesses

Five different slat thicknesses, ranging from 1/16 to ½ in. were tested and each slat was provided with ½ in. deep triangular serrations along the bottom edge. The pitch of the serrations was varied from ¼ to 2 in. Water was collected off the serration points and measured over a fixed period of time. The procedure was to fully wet the slat and then water was fed to the distributor slat at a high rate. The rate was gradually reduced, and collection measurements were made on each occasion. When water ceased to flow horizontally along the main slat the feed was increased stepwise up to the high flow rate again. This was repeated until enough measurements were taken.

Results were plotted on the basis of the proportion of water which spreads horizontally, P*, against the water rate, L. No horizontal spread occurred until a certain minimum flow rate was reached. To some extent this depended on the thickness of the slats, but no simple relationship was found between these two quantities. When the flow rate was increased, the spread increased fairly sharply and afterwards exhibited a linear relationship with L. At some higher flow, the horizontal spread decreased slightly, v.e. P* was only proportional to L for a given slat thickness *t*, over a certain flow range.

Width of the serrations on the bottom edge of the slat had little effect on the amount of liquid collected from the central serration point indicating that most of the water flowed down a narrow region, about ¼ in. wide of the slat face underneath the feed point.

These findings, however, were not in agreement with the result of the preliminary work on the spreading of liquids in actual grid packings, where it was found that the spreading characteristics of a packing were independent of the liquid flow rate over a considerable flow range. The experiments indicated that the side-spread of liquid was a function of the liquid rate.

This work was carried out with single slats and touching slat-type distributors to represent conditions existing at a single point contact in a grid packing. It was then realised that this arrangement did not truly represent the actual conditions existing in a grid packing because water ran along the top edge of the slat and travelled a considerable distance away from the feed point before spilling over the vertical face.

In a touching-grid packing, the distance over which the horizontal spread occurs along the top of any slat is limited by the two slats on either side of the feed slat. A meniscus is formed between the top-edge layer of water and a side-slat, and it is at this point that spill-over occurs. These conditions were simulated by a horizontal slat with a suitable distributor with side-slats. The presence of side-slats on either side of the distributor was found to increase the proportion of water spreading horizontally. This new arrangement was similar in construction and operation to an element of an actual grid packing and was used in further investigations.

Horizontal Spread

The effect of slat thickness was examined. It was found that horizontal spread increase rapidly with the liquid rate until a certain critical liquid rate. L_{crit}, is reached. Over a considerable flow range P remains constant and independent of L. These values of P plotted against slat thickness t (m.). The line of isotope provides P = t (1) which proved useful when dealing with actual packed towers.

Pitch of the slats had a considerable effect on the spread of liquid, but relatively little effect on the critical liquid rate. It was deduced that $P = 1.5t — 0.0538 — 0.05$ (2). This equation and (1) were used in forecasting spreading characteristics of grid packing.

Slat-depth had a small effect on the spread of liquid on wooden slats, especially at flow rates less than 8 lb./h. when the horizontal spread was slightly greater than that obtained with carbon slats. At flow rates greater than about 25 lb./h. wooden slats gave similar results to carbon slats.

Slat material was examined. Carbon proved ideal for experimental work as it could be machined with precision and wetted easily with water. Metal slats although capable of being made accurately, did not wet well. Wooden slats are easily wetted but surface blemishes are difficult to eliminate. Wetting of mild steel depended on the condition of its surface. Polished mild steel, for instance, did not wet easily and erratic results were obtained.

Contact between the slat distributor and the slat under test was very important, Dr. Mullin stated. Accurate horizontal and vertical alignment of the main slat is also necessary to prevent erratic results.

Minimum Effective Liquid Rate: This (M.E.L.R.) is defined as the flow rate below which the performance of a packed column deteriorates sharply. It has been referred to also as minimum wetting rate (M.W.R.), but the former term is considered better and is less liable to misinterpretation (i.e., implying that a packing is fully wetted at liquid rates about this minimum rate.

If the pitch of the slats in a grid is known, the number of touching points per sq. ft. of tower cross-section can readily be calculated. This, together with a value of the critical liquid rate L_{crit} (lb./hr. point of contact) for the particular slat thickness gives the 'critical liquid rate (C.L.R.) (lb./ft.^{2} of tower cross-section). Only a few values of M.E.L.R. had been published, noted Dr. Mullin, viz. 1,260[13] and 1,500[18] lb./h.ft.^{2} for ¼ in. grids pitched at 1 in., and 630[13] and 660[18] lb./h.ft.^{2} for ¼ in. grids pitched at 2 in. respectively. Morris and Jackson (1), however, had recommended that the operating liquid rate should exceed 0.85 ft.^{3}/h.ft. of wetted perimeter for grids of less than 2 in. pitch and 1.3 ft.^{3}/h.ft. for grids pitched at 2 in. or more.

From the fairly close agreement between C.L.R. and M.E.L.R. it could be concluded that M.E.L.R. for a grid packing represents that liquid rate below which the liquid spread at each touching point in the packing rapidly decreases. This explanation possibly applied to random packings also. (No published data available).

Statistical Analysis. Normal arrangement: It was shown experimentally that the amount of water which spreads in an element of a grid packing was fairly constant, for a given slat thickness over a wide flow range. The equations derived should permit the prediction of the degree of spread in a grid packing from a knowledge of the grid dimensions.

The packing constant C is defined by the equation $C = h^2Z$ (3)

where Z = height of packing
= (number of stages) × (depth of each stage)
= (number of stages) × (twice depth of each grid)
= 2nd

From (3) and $\sum_{r} r^2.p_{r.n} = nPs^2$ ...... (4)

$$C = \frac{d}{Ps^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

P has been found to depend upon the slat dimensions, particularly on the thickness, therefore C can be written in terms of the packing dimensions alone, either as the approximate relationship (from P = *t*)

$$C = \frac{d}{ts^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (6)$$

or the more accurate relationship from equation (2)

$$C = \frac{d}{(1.5t - 0.053s - 0.05)s^2} \ldots\ldots \quad (7)$$

Staggered grids: For staggered grids C becomes

$$C = \frac{d}{(p + \frac{1}{4})s^2} \quad \ldots\ldots\ldots\ldots\ldots \quad (8)$$

As explained above for a normal packing arrangement the packing dimensions may be substituted for the horizontal spread. From equations (1) and (8) the simple relationship is

$$C = \frac{d}{(t + \frac{1}{4})s^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$$

and from equations (2) and (8) the more accurate relationship is

$$C = \frac{d}{(1.5t - 0.053s + 0.2)s^2} \ldots\ldots\ldots \quad (10)$$

The effect of staggering on the spread of liquid in a grid packing can be illustrated as follows by the use of equations (6) and (9). Let the thickness of the grids be ¼ in. and the depth and pitch equal 1 in. To calculate packing constants with the same units (ft./in.²) as those given in Table I, d will be expressed in feet, t and s in inches. Then for the normal arrangement:

$$C = \frac{1/12}{\frac{1}{4}\,.\,1^2} = 0.33$$

and for the staggered arrangement:

$$C = \frac{1/2}{(\frac{1}{4} + \frac{1}{4})\,.\,(1)^2} = 0.17$$

Values of C calculated from the more accurate equations (7) and (10) are 0.31 and 0.16 respectively. Reduction in the value of the packing constant for the staggered packing indicates that a sensible increase in the liquid spread should result with this type of arrangement.

'The constant C should prove especially helpful as it would appear that values of C could be predicted from known packing dimensions by means of simple equations', stated Dr. Mullin. The utility of these equations was discussed in Part II of his paper.

Symbols used

- C = the packing constant (ft./in.²).
- d = depth of a slat (ft.).
- h = statistical constant.
- L_{crit} = critical liquid rate at a single touching point on a grid (lb./h.).
- n = number of a vertical stage in a packing (statistical analysis).
- p = a proportion (statistical analysis).
- $p_{r.n}$ = proportion of liquid at point r end stage n.
- P = proportion of liquid which spreads horizontally on the top edge of a slat in a grid packing.
- P^* = proportion of liquid which spreads horizontally on the top edge of an unobstructed slat.
- s = pitch of the slats in a grid (in.).
- t = thickness of a slat (in.).
- Z = height of a packed section (ft.).

TABLE I
Packing Constants for Various Random Packings

Type of Packing	*Size (in.)*	*Packing Constant C (ft./in²)*
Broken stone	¼	0.17
" "	½	0.19
" "	¾	0.22
Clay spheres	½	0.33
" "	¾	0.40
" "	1	0.31
Raschig rings	½	0.21
" "	1	0.25
Lessing rings	1	0.26
Berl saddles	½	0.23
" "	1	0.15

(Part 2 of this paper—'Evaluation of Packing Constants'—will be summarised in our next issue.)

Producing Polystyrene from Crude Oil by New Integrated Processing Technique

TWO firsts in the petrochemical field are: (1) integrated processing from crude oil to polystyrene at one site, (2) direct recovery of ethyl benzene from narrow-boiling, mixed xylenes stream. Ethyl benzene is subsequently dehydrogenated to styrene. Both these innovations belong to Cosden Petroleum Corporation, who have just brought on stream their 22-million-lb.-a-year polystyrene unit at Big Spring, Texas, U.S. The company will produce two grades of plastic moulding compounds: clear general-purpose and high-impact natural (*Chem. Engng.*, 1958, **65**, No. 24).

Of interest from a physical and engineering viewpoint is the ultrafractionation unit of the monomer plant designed and constructed by Badger Mfg. Co., by which ethyl benzene is obtained direct from a mixed-xylene feed stream. At the front of the styrene monomer unit there is a total of 600 ft. of fractionating height, comprising some 350 plates, to drive a wedge between ethyl benzene (b.pt. 136.2°C) and nearest boiling (b.pt. 138.5°C). The 600 ft. of fractionating height is divided into three 200-ft. columns, joined laterally by six platform levels with a fourth 185-ft. column used later in the process.

In the polystyrene plant, engineered and constructed by Blaw-Knox, Chemical Plants Division, since the water required for polymerisation and washing must be of high purity, all water lines are run in aluminium, and all vessels, from reactors to product storage silos, are glass-lined. Also to prevent dust contamination all equipment except water-treatment plant and storage silos are enclosed in air-conditioned, pressurised buildings.

Essentially, the Cosden process narrows down a fraction of crude oil until it consists only of ethyl benzene, then converting this to styrene and polymerising. Straight-run naphtha (ASTM distillation range: 150 to 390°F) is produced from crude oil in a conventional atmospheric-distillation unit. The naphtha is treated via Unifining, clay treatment or both to remove sulphur, then fed to a prefractionator and afterwards to a platformer (ASTM distillation: 150 to 300°F).

At about 900°F and 360 p.s.i.g., naphthenes are converted to aromatics over a platinum catalyst. Aromatic constituents of the Platformate are glycol extracted in an Udex unit, and are fractionated at atmospheric pressure into benzene, toluene and xylenes. The mixed xylenes, containing 25 to 30% ethyl benzene form the feedstock for the styrene monomer unit.

The feed containing the ethyl benzene enters the first 200 ft. column near its mid-point. Bottoms from this column are mixed xylenes. Rectification continues through the next two columns in series, with forward vapour feed and backward pumping of liquid reflux.

Cosden report that they have obtained ethyl benzene of 99.7% purity. The ethyl benzene passes to a dehydrogenator where it is converted to crude styrene over iron, chromium and potassium oxides. The reactor effluent contains about 40% styrene and the rest is largely ethyl benzene. Some benzene and toluene contained in the ethyl benzene are separated in a small soft high fractionating tower.

Ethyl benzene recycle is vacuum distilled in the fourth (185 ft.) tower noted above. The high-purity monomer is vacuum distilled from the polymer and tars and stored in refrigerated tanks below 60°F to prevent polymerisation.

Monomer is charged to one of four glass-lined, stirred, batch reactors together with water and suspending agents. The catalysed suspension of polymerisation product forms a slurry of solid polystyrene heads in water. After the reaction, the slurry is water-washed and the heads formed separated in a Bird continuous solid-bowl centrifuge. The heads are dried in a steam-heated rotary drier and pneumatically transferred to storage for blending and testing.

Fuel Efficiency Diary

Second edition of the 'Industrial Fuel Efficiency Diary, 1959,' edited by H. B. Locke, and published by H. O. Quinn Ltd., 151 Fleet Street, London E.C.4, is priced at 8s. 6d., 11s. 6d., or 13s. 6d. New material is included in all sections, comprising physical data, fluid flow, fuels, combustion and steam raising, instruments, steam usage, heat transfer, prime movers, and generally including tables. New charts and nomographs are added so that all calculations can be done with the diary, no slide rule being needed.

BRITISH GEON START SALES DRIVE ON £200 M. PIPE MARKET

Campaign for High-Impact Rigid P.V.C.

A CAMPAIGN to boost sales of Geon RA.170 high-impact rigid p.v.c. among pipe manufacturers and pipe users has been launched by British Geon Ltd. (one of the Distillers Plastics Group), Devonshire House, Piccadilly, London W.1. British Geon see this market as being worth a potential £200 million and one covering water and pipe, gas pipe, pipe for conveying chemicals, oils, effluent, and other uses.

The production of Geon R.A.170 is the result of a four-stage research project by the company. The first line of attack was to discover how to modify the existing base polymer, Geon 101, in such a way that it would process more easily in rigid form. After several years, this work resulted in the production of Geon 111 and 113.

The next stage involved developing a material ready for processing directly into pipe and sheet form. This work led to RA.170, but it was not at this stage generally released. Processing research was the next phase and the technique of production of pipe and sheet was fully explored to enable the correct extrusion conditions to be established for the guidance of pipe manufacturers.

At the same time checks were made on the enhanced suitability of the new material for various markets. The most important requirement, greater impact strength, was met and for Geon RA.170 this is some 15 times greater than ordinary rigid p.v.c.

Working Pressure Limits

Average limits for permanent working pressures are given as follows: 1 in., 200-300 lb./in.^{2}; 3 in., 100-200 lb./in.^{2}; 6 in., 100-150 lb./in.^{2}; 12 in., 50-100 lb./in.^{2}

As high-impact p.v.c. is a thermoplastic material, pressure rating falls as temperatures are increased. Allowances of the following order must be made: at 20°C, as specified; at 40°C, 75% of rating; at 60°C, 40% of rating. Pressure losses are about 10% less than with new steel pipe and 20% less than steel pipe after a period of service.

The company now reports considerable success in overcoming what it calls conservatism against the use of a new material. This they say is due to its anti-corrosive properties and high-impact strength, ease of installation and low flow-resistance.

A number of water undertakings have installed rigid p.v.c. pipe with the object of gaining experience. It is also understood that all the potable water at the Bradwell nuclear energy station will be carried by a five mile length of 3 in. and 4 in. pipe. A number of gas boards are working with the company in view of the heavy corrosion of buried iron pipes. Main development work in this field is being undertaken by plastics pipe manufacturers. The only significant technical difficulty reported so far is caused by certain individual components in town's gas in a few areas. These components are being identified and the matter is due to be discussed further.

The Gas Council and North Thames Gas Board have been examining both ordinary rigid and high-impact p.v.c. pipe and it is reported that p.v.c. has proved satisfactory for coal gas.

As long ago as 1946 some 1,200 tons a year of p.v.c. pipe was being used by the German chemical industry, together with an extra tonnage of fittings. Progress in the U.K. chemical industry is said to 'lag sadly behind'. The oil industry is said to be more disposed to look at plastics. Most recent progress has been in effluent pipes and installations include those at the Atomic Weapons Research Establishment, British Geon's Barry factory, a sewerage works, and the Esso Refinery, Fawley, for acid disposal.

The British Geon campaign is being accompanied by a sales drive on the part of pipe users and manufacturers, several of whom have produced new technical literature.

Chemidus Pipe

Chemidus Plastics Ltd., Purley Way, Croydon, who have mainly concentrated on sales to the chemical industry, have recently worked on the development of Chemidus pipe for effluent lines, water systems and fume extraction systems. A new 31-page composite technical publication deals with Chemidus 2000 unplasticised p.v.c. pipe, seamless ducting and solid and cored bar. Also included as data on Hi-20 high-impact p.v.c. pipe. Intended mainly for chemical engineers, maintenance engineers on chemical plant and plant design engineers, copies are available from the company.

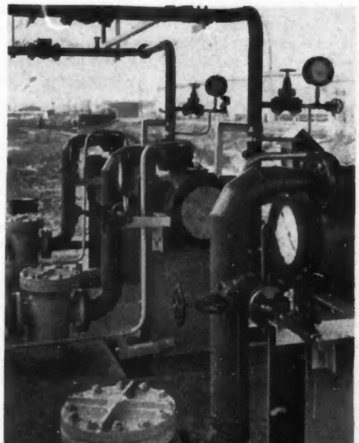
Extrudex Ltd., Bracknell, Berks, who are now producing Hipact p.v.c. pipe and tube in large quantities in all sizes from ½ in. to 12 in. bore, describe their range of high-impact p.v.c. fittings moulded with Geon RA.170 in a new brochure. Over the past few months, Hipact has taken over a steadily increasing proportion of the Extrudex pipe production capacity at the expense of polythene and ordinary rigid p.v.c. Recently, more than 2,500 ft. of 12 in. diameter Hipact piping were installed by the Arab Potash Co. for conveying concentrated potash solution from the Dead Sea to evaporating pans. Each of the 30 lengths in which the pipe was shipped could readily be handled by two men, state Extrudex. The installation includes 18 90° bends, 10 100° bends, about 200 loose collars and 200 cast iron enveloping flanges. Jointing was carried out with solvent welding.

BTR Industries Ltd., Leyland, Lancs, are now making high-impact rigid p.v.c. pipe, fittings and valves for use by the chemical industry, pulp and paper mills, oil refineries, as water pipe and in ventilation systems. In general the company recommends the use of socket type fittings in preference to threaded because they have greater resistance to internal pressure and vibration. Socket type fittings are particularly recommended for installations operating at more than 120°F. The piping bends easily when heated and can be removed and re-used.

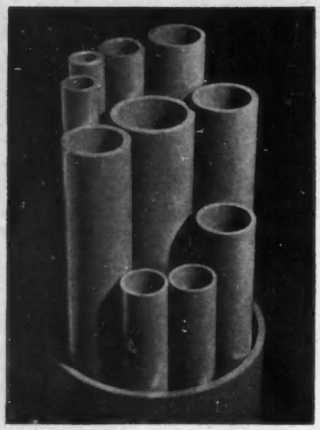
Formica Ltd., Cavendish Works, Buckhold Road, London S.W.18, state that thermoplastics piping for gas service has passed beyond its merely speculative stage and has become a practicable measure for development. Sample pipes are now being subjected to long-term field tests by many gas boards. High-impact p.v.c., from British Geon, is being developed for gas piping by Formica after many experiments with alternative plastics because it offered the most useful combination of physical and chemical properties for the purpose.

Formica state that laboratory and service tests have shown this piping to be unaffected by the most aggressive soil conditions, physically resistant both to crushing loads and to shock; tough and flexible; light, simple and economical to install and connect. Formica believe that official confirmation of these qualities by the present official tests will herald a revolution in methods of gas distribution.

The Durapipe Co., Winnock Road, West Drayton, Middlesex, will shortly



Part of an acid effluent disposal system made with Hipact p.v.c. piping at the B.P. Isle of Grain refinery. The 11,000 ft. of piping were made by Extrudex



Samples of HI-20, the new high-impact rigid piping now being produced by Chemidus Plastics, using Geon RA.170

announce an addition to their range—Durapipe V pipe and fittings made from Geon high-impact p.v.c. The development work is now almost completed and it is stated that the pipe and fittings may well represent the widest range of sizes and shapes at present available. The particular place in the chemical industry for Durapipe V is said to be in corrosion resistance usages where fire risk is important.

David Moseley and Sons Ltd., Ardwick, Manchester 12, have now published a new booklet on p.v.c. piping. Details are given of recommended pressures at 75°F and 150°F for various sizes of normal impact p.v.c. pipe and for high-impact pipe. This information is given on three gauges of pipe—light, medium and heavy. For high-impact medium and heavy gauges, data is provided for both plain and threaded pipe. Recommendations are made for jointing techniques.

The company states that ability to compete with existing pipe materials on a price basis will be enhanced when the cost of p.v.c. compound is reduced, a step which pipe makers hope will be possible as tonnage sales increase.

Yorkshire Imperial Metals Ltd., Leeds, say they have supplied Polyorc BH high-impact p.v.c. tubing for many types of installations in the chemical and allied processing trades. This company is now preparing a more comprehensive catalogue dealing with their high-impact p.v.c. tubing which is being offered in sizes up to 6 in. bore in a range of four wall thicknesses per size, comprising 57 and 142 p.s.i. pressure series for both screwing and cementing.

I.C.I.'s Divisional and Functional Organisation Described by Sir A. Fleck

THE organisation of Imperial Chemical Industries Ltd., from the direction at the top to the decentralised administration of a centralised policy, formed the theme of an address by Sir Alexander Fleck, I.C.I. chairman, at Melbourne recently. Under the title of 'Some thoughts on the organisation of large technological concerns,' he gave the Russell Grimwade lecture, on the occasion of his recent visit to Melbourne to open the new headquarters of Imperial Chemical Industries of Australia and New Zealand.

He began by saying that the directors were there to give direction to the enterprise in the form of leadership, purpose, control and responsibility. There were two main fields in which the board needed to exercise its control to ensure present effectiveness and future prosperity; the first being the selection and training of staff and the second the formation and use of capital.

Starting with the staff at the top, it was a great advantage to have on the board a number of outside or 'lay' directors with perhaps more objective minds when considering major policy. It would be a mistake to have all the directors as chemists of one kind or another, salted with the odd physicist and engineer, and an accountant thrown in for good measure.

While the board should make the main appointments, they should not make appointments too far down the line. Delegation of responsibility in a large organisation was inevitable and highly desirable from the point of view of training for management succession.

In the present competitive times it was not good enough to keep in the same place and the board must ever look ahead to see that the organisation 'is several jumps ahead.' That might entail extending plants or building new ones. In either case capital would be at stake and he held that in modern industry, the most important single factor was the productivity of capital. It was not uncommon to have £15,000 of fixed capital investment behind each process worker, sometimes substantially more. The directors had the important task of deciding what proportion of its profits should be retained and ploughed back into the business. But the speed of development and the need for investment was such that sooner or later an approach might have to be made to the market; the decision in both timing and terms demanded skill, nerve and sometimes luck.

Sir Alexander, while stressing that profit was the basic measure of industrial efficiency, said he did not believe that the making of profits would alone account for all the motives of those who ran a business. An organisation had a responsibility to the community. On the negative side there was the need to refrain from the discharge of noxious vapours under the effluents. On the positive side, there was the question of making premises attractive and making a contribution to community life.

His own personal experience convinced him of the need to work to the principle of 'centralised policy/decentralised administration.' A large company had to be split into a number of functional groups—production, design and construction, research and development, personnel, finance, sales and commercial services, exports.

I.C.I. were organised along functional lines and were also split into operational groups, each one concerned with the production of a group of chemicals and each the special interest of an executive director of the board. The groups were subdivided into manufacturing divisions, each of which had their own boards of delegate directors—a chairman, two or three deputies who acted as managing directors, and personnel, research, commercial, etc., directors. The organisation was flexible and differed from division to division.

At present, I.C.I. had about 80 factories operating and each of the bigger of those was in turn roughly a microcosm of the division board and of the main board. The works manager and his deputies would correspond to the chairman and his deputies. On his works' management committee, which corresponded at the higher level to the division board, he would have the managers representing the sections within the factory manufacturing different products, a works engineer, a distribution manager, a works accountant, etc.

This analytical process, or decentralisation of administration, recognised the importance of delegating responsibility and at the same time respected the local character and identity of the constituent elements.

Many units in I.C.I. had interlocking interests—paints and dyestuffs, for example, had an obvious connection. So had the Metals Division, which fabricated titanium, and the General Chemicals Division, which produced the titanium sponge by a chemical process. The separate units were bound more closely by the appointment of directors from one delegate board to act as 'visiting' directors to another.

Sir Alexander then spoke of the effect of the unifying or synthesising effect of joint consultation. This was a most valuable and vital part of company internal relations. Twice a year at a Central Council meeting, the I.C.I. executive board met and discussed subjects of mutual interest with elected representatives of the payroll worker and appointed members from works management, from works and division councils.

When the other fellow, be he chairman, director, works manager or payroll employee, was seen and talked to freely, then mutual understanding followed to a degree obtained by no other method.

Manchester Alkali Inspectorate

One district alkali inspector is based on Manchester at present and it is hoped to appoint an additional inspector next year. This was stated at question time in the House of Commons last week.

Rayon Research Association Develops Products for Exploitation by Industry

OVER the past few years the British Rayon Research Association has developed a 'spotting' agent, BRRASK AY, for the removal of oil stains from loom-state cloth. Because the interest in, and use of BRRASK, has been so great the association wants to put the sale of this product on a proper commercial basis. The chemical manufacturer making the product is to take over sales and publicity.

Referring to this in the 'Eleventh Annual Report', October 1958, the director of research, L. A. Wiseman, also announces that a scouring fluid BRRASK PS 1, which is a special emulsion, has also been developed (which can be used either (a) for stain removal by one pad/scour process, or (b) for removal of any patches which are only liable to occur on certain fabrics) left after local spotting'. This emulsion is undergoing tests in a number of members' works.

Removal of Sulphur

The problem of the rapid and complete removal of sulphur from fabrics made from undesulphurised viscose yarn is being studied. Some preliminary experiments have been done on the use of acid chlorite or hydrazine as possible one-stage desulphurising and bleaching agents. Both methods are reported as promising, but their commercial value has not yet been assessed. Another approach to this problem has been the development of a padding solution BRRASK PS 2—which combines an all-over stain treatment with desulphurising.

One of the main fields of basic research is the development of chemical methods of modifying the physical properties of cellulosic materials.

Alkaline Degradation of Cellulose: During the production of viscose from wood, the cellulose in the wood pulp is treated with alkali at a number of stages. It was known that treatment with alkali, under certain experimental conditions, could lead to the loss of cellulose and that, at the same time, the cellulose could ultimately become resistant to the action of alkali. Past work had shown that the alkali (sodium hydroxide) attacked from one end of the polymer chain, and a mechanism had been put forward which accounted for one of the products (D-glucoisosaccharinic acid). The reaction scheme, however, did not account for the formation of other organic acids (70% of the total acids produced).

Some preliminary experiments with the compound diacetyl, $CH_3COCOCH_3$ which is a model for a suggested intermediate of the reaction scheme, suggested that the dicarbonyl compound could break down in a different way and produce the other acids. The association believes it has successfully isolated this compound and preliminary findings indicate that, in aqueous sodium hydroxide, it yields acids corresponding to those from cellulose.

In some parallel studies to the above, the alkaline degradation of cellobiose has been studied. The yield of acids from glucose (cellobiose degrades in alkali to give isosaccharinic acids and glucose) has been found to be inversely proportional to the strength of the alkali and, when this was taken into account, it was established that there was no specific action of the calcium ion. Studies on substituted glucoses have shown that the glucosyl ion degrades differently from glucose. Recent work has been to clarify details of the reaction mechanisms.

Oxidation of Model Compounds: It is stated that whereas the reaction initiated on simple primary and secondary alcohols with anthraquinone and di-tertiary butyl peroxide as the photosensitiser is one of attack on the α-hydrogen atom, i.e. the attack is specific; initiation by OH radicals from the photodecomposition of hydrogen peroxide leads to attack on hydrogen atoms other than an α-hydrogen atom, i.e. the attack is not specific.

Factors Understood

On the basis of this work, although the details of the reaction of OH radicals with methanol are not clear, an understanding of the factors which control the photosensitised attack of oxygen on primary and secondary alcohols, glycols, ethers and glycosides has been obtained, that is, there is probably sufficient information to be able to understand the primary reactions of oxygen, in the presence of a photosensitiser, on the different reactive groups in cellulose. Physical properties of polymers and polymers solutions are under investigation. In the network theory of polymer solutions developed in the association's laboratories, a prediction was made of the 'elastic' recovery which occurs when all the stresses on a liquid undergoing steady shear flow are suddenly removed. One of the simplest ways of testing this prediction, it is stated, is to carry out measurements in a co-axial cylinder viscometer. One of the predictions is that there should be an expansion perpendicular to the previous stream lines. In the viscometer such lateral expansion is impossible and a solution of the theory for this case has been obtained.

Characterisation of Fibres: Determination of the data necessary to define completely the mechanical behaviour of a fibre has never been carried out, the association reports. It proposes to start by attacking the simpler problem of a purely elastic material which is uniaxial (transversely isotropic). Polythene has been selected because (a) it is chemically stable and non-hygroscopic, (b) although normally crystalline, it can be obtained in the amorphous state, (c) it can be cross-linked without chemical treatment, and (d) its structural properties have been extensively investigated. It is hoped that such a uniaxial system can be completely characterised with regard to its mechanical behaviour and that the dependence of the five constants on structure can be determined. The measurements on the Young's modulus have been started.

Structure of Solution-spun Polymers: It is not known, except empirically, what factors determine whether a structure is formed or how they determine the nature of the structure. This is of importance, because the type of structure determines the mechanical and other properties of the fibres produced from such polymers. Any increase in order in the structure (e.g. formation of crystalline regions) will almost certainly be accompanied by a change in density. The association therefore believes that it will be possible to follow these changes by any method which can detect density (or volume) changes. Two such methods are dilatometry and light scattering and these are being applied to cellulose triacetate in various solvents by studying the changes occurring during gelation, by cooling. The behaviour on cooling, however, has been much more complicated than expected, in that transitions occur which do not appear to be associated with any alteration of configuration.

Other projects being dealt with by the association include physical structure of fibres, frictional properties of polymers, water absorption of textile materials, yarn structure and photochemistry of dyes.

Chemical Analysis in Cosmetic Industry

CHEMICAL analysis in the cosmetic industry was the subject of a recent talk given by Mr. S. J. Bush (County Laboratories Ltd., Stanmore) to members of the Society of Cosmetic Chemists. He described as satisfactory in most cases two methods of determining ethylene oxide in condensates, both depending on decomposition with hydriodic acid. The determination of water by distillation with an immiscible solvent was found to be widely applicable to cosmetic products, but alcohol interfered. The interference of glycerol could be eliminated by using benzene as entrainer.

In the discussion period, Dr. W. W. Myddleton made some comments on the use of calcium carbide in the estimation of water in products; the estimate being made by measuring the acetylene gas pressure produced in a closed system. Referring to the Dean and Start estimations for measuring the specific gravity of water (plus any other liquids mixed with it), Dr. Myddleton suggested that a D. and S. value should be quoted, a precise water content not being given.

Overseas News

HOECHST'S PLAN TO PRODUCE ETHYLENE AND POLYPROPYLENE IN AUSTRIA

AUSTRIA'S present refining capacity is now about 2½ million tons a year, but it is expected that when, in the middle of 1960, the new Schwechat refinery under construction is ready, this capacity will increase to 4,160,000 tons a year.

The new refinery will save Austria from purchasing high-octane gasoline elsewhere, and will permit the execution of the petrochemical scheme promoted by Farbenwerke Hoechst A.G. The petrochemical project includes a plant costing from 60 to 80 million Austrian shillings (£¾ million to £1 million) for transforming ethane into ethylene. It will produce about 7,000 tons of ethylene a year. About half of the ethylene produced will be processed to give polypropylene for the new petrochemical works which Farbewerke Hoechst are building at an estimated cost of 120 million Austrian shillings (about £1¾ million). The remainder of the ethylene will be supplied to Danubia Petrochemie A.G.

The two petrochemical plants are to go on stream at the end of 1960.

Steps are being taken to utilise for chemical purposes, natural gas. To this end Hiag Werke A.G. are building a plant designed to produce 8,000 tons of methanol a year. The methanol will be used for the production of formaldehyde.

This year, investments in Austria's petroleum sector will total about 1.1 milliard Austrian shillings (£153 million approximately).

Dominician Republic Pest Control Firm Expands

The Dominican Republic firm of La Exterminadora, Ciudad Trujillo, has started the production of insecticides, rodenticides and other pest control products under an expansion plan. As a result the company's imports of chemicals and raw materials will increase from $40,000 in 1958 to $200,000 in 1959.

New Polythene Emulsion

A fibre softening agent made from polythene has been issued under the trade name of 'A-C Polyethylene 629' by the American Allied Chemical Corporation. Allied Chemical states that trials with silicones and fat-based plasticisers to this end showed that the first of these was too expensive for the purpose and the second too quickly washed out. The new agent is suitable for both synthetic and natural fibres.

Geelong Sulphuric Acid Plant in Productoin

The Shell Oil Company's plant for sulphuric acid, built near Geelong, Victoria, Australia, is now on stream. Capacity is 100 tons per day and the whole of the output will be taken by Cresco Fertilisers Co., Geelong, who have previously imported sulphuric acid from the U.S.

Japanese Trichomycin Licence for German Company

Chemie Grünenthal G.m.b.H., Stotberg, West Germany, have bought from the Japanese pharmaceutical company Fujisawa Pharmaceutical Co., a licence to manufacture the antibiotic trichomycin. The licence not only allows Grunenthal to sell the antibiotic in Western and Eastern Germany, but also to export to Austria, Iran, Lebanon, Jordan and Saudi Arabia.

New Firm to make Alkaloids

A new company, Stauffer Pharmaceutical Inc., is to be set up in the U.S. by the West German company E. Merck AG, Darmstadt, and the Stauffer Chemical Corp., New York. The new company will manufacture alkaloids and fine chemicals for sale in the U.S. and Canada.

Italian Stocks of Raw Sulphur

During the past eight years, stocks of raw sulphur which Italian producers have held have been as follows: 1951, 35,090 tons; 1952, 99,481 tons; 1953, 224,257 tons; 1954, 313,264 tons; 1955, 335,916 tons; 1956, 276,536 tons; 1957, 204,824 tons; 1958 (30 September), 233,791 tons.

Dutch Pharmaceutical Investment

Holland's largest pharmaceutical manufacturers, Verenigde Pharmaceutische Fabrieken N.V., Apeldoorn, are to begin a large-scale investment programme to keep pace with the rapid development of the world pharmaceutical industry. The programme will be spread over the next few years and in view of the size of the sums to be invested the dividend will be maintained at 9%.

Heat and Radiation-stable Polymers via Fluorocarbons

As starting materials for preparing heat- and radiation-stable polymers, aromatic fluorocarbons have been studied by W. J. Plummer, L. A. Wall and R. E. Florin of the U.S. National Bureau of Standards. Hexafluorobenzene is believed by these investigators to be a very useful compound since it can be used as a starting material for synthesising new monomers or compounds containing the perfluorophenyl group.

Previously, earlier syntheses yielded only small amounts of hexafluorobenzene. The N.B.S. workers have, however, modified a method developed by Desirant in Belgium. The procedure is to pyrolyse tribromfluoromethane at 540°C in a platinum furnace. Pressures from 50 to 265 p.s.i. are used and yields are stated to be better than 55%. Using furnaces of borosilicate glass, graphite, or nickel yields are of the order of 20 to 50%.

An 80% yield of pentafluorophenol has been obtained by Plummer *et al.* using hexafluorobenzene and potassium hydroxide in a pyridine medium. They have also reduced hexafluorobenzene with hydrogen using platinum or palladium mounted on activated charcoal pellets as a catalyst. The yields range from 40 to 60% pentafluorobenzene.

Low molecular weight polymers have been produced that distil out at 350°C. Starting material for the polymerisations is sodium pentafluorophenolate which is thermally decomposed to make the polymer. Partially fluorinated styrene monomer has also been produced. Latest investigations are on the production of a completely fluorinated styrene ring monomer and on the siloxane polymers. For these last pentafluoromagnesium Grignard is reacted with silicon tetrachloride. A 30% yield of tetra-*cis*-fluorophenylsilane is obtained.

Expansion of Korea's Fertiliser Industry

Leader of North Korean Governmental Planning Commission has announced that fertiliser manufacture will be given priority in the future. Production of nitrogen and phosphate fertilisers is aimed at reaching 630,000 tons by 1961, compared with 197,000 tons in 1957. Production before the Korean war was 394,000 tons.

Increased outputs are to be achieved by better utilisation of existing capacity and by building new plants. Among new plants planned is an ammonium nitrate plant which is expected to come on stream this year and to have a capacity of 13,500 a year. It is also expected that a sulphuric acid plant having a capacity of 30,000 tons a year will be on stream by the end of this year. Plans are also in hand to build a superphosphate plant having a capacity of 100,000 tons a year.

Polythene Granulates from Chemische Werke Hüls

Two new low-pressure polythene granulates, Vestolen SP and Vestolen R, have been developed by Chemische Werke Hüls AG. The first is designed for injection moulding; with a mean molecular weight of $\sim 10^5$ and reduced viscosity of 2.0-2.1, it can stand up to injection temperatures of 180°-250°C. and injection pressures of about 1,000 kg./sq. cm. Vestolen R, with a reduced viscosity of 3.6-3.8 and a 2% carbon black content, is to be used for piping manufacture.

PEOPLE in the news

● An award under the Royal Society and Nuffield Foundation Commonwealth Bursaries Schemes has been made to Dr. I. C. R. Bick, senior lecturer in organic chemistry, University of Tasmania, to assist him to visit Cambridge, between June 1959 and March 1960, to study the latest developments and research techniques in natural products organic chemistry. Other awards have been made to Professor P. C. Dutta, professor of organic chemistry, Indian Association for the Cultivation of Science, Jadavpur, to enable him to gain experience in the field of alicyclic compounds related to terpenoids at Imperial College, London, and Oxford, for about ten months from May 1959; and to Dr. Jean M. Tyler, I.C.I. research fellow, department of chemistry, Edinburgh, to enable her to carry out structural investigations on West Indian natural products at Kingston, Jamaica, for a year from April 1959.

● Dr. A. J. Kesterton, at present superintendent of steel production, Steel Company of Wales Ltd., will become managing director of Davy British Oxygen Ltd. early in 1959.

● Lord Reith has been elected vice-chairman of the British Oxygen Co. Ltd.

● Mr. F. H. Ewens has been appointed chairman of W. Canning and Co., in succession to Sir Ernest Canning. Mr. W. H. Griffin has been appointed joint managing director with Mr. Ewens. Mr. B. Tromans, who been connected with the chemical division for 17 years, has been elected to the board.

● Mr. P. A. Raine, F.R.I.C., chief chemist for the past 10 years of Johnson and Phillips Ltd., has resigned to take up the position of chief chemist of the Crown Cork Co. Ltd., Southall, Middlesex, on 1 January. Vice-chairman of the London section, Royal Institute of Chemistry, Mr. Raine is a member of the committee of the Corrosion Group, Society of Chemical Industry. He is best known in the electrical industry for his work on corrosion-prevention in cables and electrical equipment. Mr. Raine is a companion of the Institution of Electrical Engineers.

P. A. Raine

● Mr. Peter W. Cooke, recently appointed manager of the newly created Magcobar Division of Dresser (Great Britain) Ltd., 197 Knighsbridge, London S.W.1, will be responsible for that company's activities in Europe and the Middle East.

Mr. Cooke will also represent Magcobar's industrial department, whose product line includes bentonite, clays used in the insecticide industry as carriers and diluents; and barite aggregate. Prior to his new appointment, Mr. Cooke served on the London headquarters staff of British Petroleum Co., as senior chemist responsible for the mud operations of the company's widespread drilling activities.

O. Secher, who has been appointed to the board of Solway Chemicals Ltd. (See 'Chemical Age', 13 December, p 1000)

● Dr. C. E. Birchenall (associate professor of chemistry, Princeton University, U.S.) has accepted an invitation from the metal physics committee of the Institute of Metals to lecture on 'The oxidation of metals at high temperatures'. The lecture will be given at 6.30 p.m. on 15 January at 17 Belgrave Square, London S.W.1. Visitors will be welcome.

● Mr. K. A. Hogan, a director of Powell Duffryn Ltd., of Stephenson Clarke Ltd., and of other companies in the Powell Duffryn group, will relinquish these directorships at the end of March, 1959, in order to take up another appointment. His advice will, however, continue to be available to the group.

● Mr. E. F. Miller, formerly northern representative, has been appointed manager of the new Scottish office to be opened shortly by Croda Ltd. at 42 Frederick Street, Edinburgh.

● Mr. E. J. Cooper has been appointed general secretary of the Scientific Film Association, 3 Belgrave Square, London S.W.1.

● Mr. N. E. Bean, B.A., has been appointed sales manager, chemical products for BX Plastics Ltd., London E.4. This division includes nitrocellulose, terpene resin, camphor and a number of other chemical products.

● Commander P. W. Kent, R.N., chairman of George Kent Ltd., Luton, on 17 December presented a farewell gift to Mr. J. Horridge, works manager since June 1951, who will be retiring early in 1959 on medical grounds. The gift was subscribed for by all Mr. Horridge's friends in the Kent factories at Luton, Hitchen and Resolven, South Wales. Mr. J. F. Willsher has been appointed general works manager.

● Mr. Edward Gurr, director of Edward T. Gurr Ltd., laboratory chemists, Upper Richmond Road West, London S.W.14, on a recent tour of South East Europe, spent some time in Turkey studying the Turkish chemical industry. He found that the principal heavy chemicals produced there are caustic soda, sulphuric acid, orpiment, sulphonated oil, and oils.

The pharmaceutical industry is on a small scale, and neither it nor the heavy and fine chemical industries produce enough to meet the country's needs. Among imports are caustic soda, boric acid, copper sulphate, ammonium chloride, sodium carbonate, calcium carbide, trichloroethylene, sulphate drugs, quinine, vitamins, antibiotics, aspirin, drugs for agricultural and veterinary practice, plastics, soaps, paints, etc.

Edward Gurr, who has recently toured South-east European countries

Obituary

Mr. William Elkington Wright, F.C.S., a former director of the Pyrene Co. Ltd., Brentford, Middlesex, who was primarily responsible for the Metal Finishing Division, died on 11 December. He joined the company nearly 30 years ago and pioneered in this country the use of phosphate coating processes on a production scale.

Petrochemicals Chimney Causes Local Concern

In the Commons last week, Mr. Frank Allaun (Lab. Salford East) asked the Minister of Housing if he was aware of the fears of neighbouring local authorities of chemical pollution from a chimney planned by Petrochemicals Ltd., Carrington, which would emit heavy amounts of SO_2 daily.

The Parliamentary Secretary to the Ministry, Mr. J. R. Bevins, replied that he understood that the neighbouring local authorities had expressed their views of the recent enquiry. The report of the inspector who conducted the inquiry would be ready soon, and the Minister would study it carefully before reaching his decision.

Commercial News

• Murex Report Decline in Trading Results
• New Valve Company Formed by J. Gordon
• E.N.I. Account for 94% of Italian Methane
• Midland Tar Pay 'Ordinary' of 10%

Murex Ltd.

A substantial decline in trading results is reported by Murex Ltd. for the half-year to 31 October 1958, compared with the corresponding period of 1957. Consequently, the interim dividend is reduced from 7½% to 5%. A final dividend of 10% made 17½% for the year to 30 April 1958.

It is stated that the sharp decline in overall demand for the metallurgical products of the parent company experienced in the closing months of 1957-58 has continued during the past six months due to the further recession in the non-ferrous industries.

The directors report that there are few signs of any market improvement in the demand for the principal products and competition continues to be severe. Stock losses during the period have been negligible. Present indications also are that the group results for the current year will be below those of the preceding year.

Expenditure on the modified capital programme will be met from present resources and accommodation made available by bankers. It has not yet proved necessary to draw upon this accommodation.

Powell Duffryn Ltd.

An interim dividend has been declared by Powell Duffryn Ltd. of 6% actual less tax on the 9,660,471 ordinary 10s shares in respect of the year ending 31 March 1959.

James Gordon Valves

A new company, James Gordon Valves Ltd., has been formed to take over the valve activities of James Gordon and Co. Ltd., a member of the Elliott-Automation Group. It will handle the design, manufacture and sale of the specialised Gordon range of control valves, which include tight shutting butterfly valves developed during recent years for such applications as gas-cooled nuclear reactors and wind tunnel dampers.

Head offices of James Gordon Valves will be at Airport Works, Rochester, which is already the home of the other valve companies within the Elliott-Automation Group. The directors are G. C. Fairbanks, H. Masheder, J. E. O'Breen and H. R. Walton.

E.N.I. Group

Annual report of the Italian State-controlled E.N.I. Group shows that the group accounts for about 94% of the whole Italian output of natural gas. E.N.I. started the production of methane in 1936 and during the initial five years, the output of this gas averaged only 3.5 million cu. m. a year. Since the war, however, output has increased steadily to the figure of 4,684 million cu. m. in 1957.

Last year 65.8% of output went as industrial fuel and 7.4% for chemical processing. In the beginning of 1958, the increase in production slackened and during the first eight months of the year Italian output of natural gas averaged about 407 million cubic metres a month, or about 2.6% less than the average output recorded in 1956.

Midland Tar Distillers Ltd.

Certain changes had been agreed, Mr. R. B. Robinson, vice-chairman of Midland Tar Distillers Ltd., reports (on behalf of the chairman, Mr. Stanley Robinson), to be operated as and from 1 July 1957, the effect of which is to be seen in the year under review. A year ago the chairman had said that the time had come for a review for crude tar producers. When the present agreement was negotiated it was impossible to have foreseen the extent to which inflation was going to alter prices and values.

Despite the alterations and certain trading difficulties, the directors are recommending an ordinary dividend of 10%. During the year a dividend of a capital nature had been received from the company's shareholding in Benzole Producers Ltd. This is to be distributed to the ordinary shareholders as a capital dividend of the rate of 8d per ordinary share, free of tax.

Reconstruction of the Nechells Works is progressing; the new distillation plant and its ancillary equipment are complete and are now being commissioned.

The benefit of the capital outlay incurred in creating the Four Ashes refinery is now beginning to be felt. Costs and yields there in the refining processes which produce phenol, refined cresylic acids, pyridine, naphthalene and the like, 'give cause for considerable satisfaction'. As these products form the starting point for a number of secondary derivatives with various known and potential uses, this has been borne in mind, and in due course the company expects to be able to offer selected derivatives. Costs and yields at Oldbury are also a 'matter for satisfaction'.

Pechiney

In an end-of-year letter to shareholders, Pechiney, of France, state that turnover for the year has been some 19% up on 1957, despite a falling-off in metal sales. Chemical sales rose sufficiently to bring the increase in business up to this level. Particularly high were sales of chlorine-content solvents and plastics materials. During 1958, Pechiney started the production at Calypso, of high-purity beryllium.

The subsidiary petrochemical company Naphtachimie, who operate a plant at Lavéra, near Marseilles, have now started on a new expansion programme. The supplying of low-pressure polythene from the plant has already begun.

Will

Mr. Edward William Plowman, former director of I.C.I., who died on 20 September last, left £17,054 net.

DIARY DATES

THURSDAY, 1 JANUARY
Polarographic Soc.—London: Duke of York, Dering Street, W.1, 7 p.m. Discussion meeting on polarographic problems encountered in semi-conductor field.

Air-coolers at Esso Butadiene Plant

These Head Wrightson air coolers on the butene dehydrogenation plant, at Esso's new Fawley butadiene facility, represent the first large-scale use of air-cooling in a U.K. refinery. The use of air reduces pollution problems, is cheaper and needs less servicing. (See C.A., 13 December, page 982, for description of plant)

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s 3d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

ACCEPTANCES

Open to public inspection 28 January

Production of substituted piperazines. Union Carbide Corp. **808 178**
Oscillating column combustion apparatus. Junkers & Co. G.m.b.H. **808 210 & 808 215**
Process for obtaining pure trimethylolpropane. Farbenfabriken Bayer A.G. **808 101**
Cyclopentanophenanthrene derivatives. Syntex S.A. **808 043 & 808 044**
Process for making crimped thermoplastic synthetic linear polymer filaments. Imperial Chemical Indusries, Ltd **808 213**
Method of increasing the fatty contents of such micro-organisms as yeast, bacteria and moulds. National Research Development Corp. **808 128**
Oil-modified polyester resins. General Electric Co. **808 102**
Purification of precipitated silica. Columbia-Southern Chemical Corp. **808 129**
Pyridones and process for the manufacture thereof. Roche Products, Ltd. **808 045**
Substituted pyridone-acetic acid derivatives and process for the manufacture thereof. Roche Products, Ltd. **808 046**
Continuous production of liquid-explosive nitric esters. Imperial Chemical Industries, Ltd. **808 103**
Complex calcium salts of oxidised petroleum oils. Socony Mobil Oil Co., Inc. [Addition to 806 915.] **808 130**
Electro-deposition of copper from aqueous alkaline cyanide solutions. Udylite Research Corp. **808 104**
Production of polymers. Imperial Chemical Industries, Ltd. [Cognate application 11 288.] **808 132**
Production of azulenes substituted in the 4- and/or 8-position. Ziegler, K. **808 181**
Production of stabilised austenitic cast steel. Brown, Boveri & Cie. A.G. **807 925**
Manufacture of composite yarns. Courtaulds, Ltd. **808 137**
Bath and process for dyeing textiles. Nederlandse Organisatie Voor Toegepast-Natuurwetenschappelijk Onderzoek ten Behoeve van Nijverheid, Handle en Verkeer. **808 219**
Ceramic insulating materials. Bloch, W. E. H. [Addition to 699 155.] **808 068**
Bonding together of surfaces of polymeric linear terephthalate esters. Du Pont de Nemours & Co., E. I. **808 186**
Manufacture of sulphonyl-ureas. Farbwerke Hoechst A.G. **808 071**
Hydroforming. British Petroleum Co., Ltd., Moy, J. A. E., and Spencer, E. H. **808 140**
Injector device for impregnating liquids with gases or for mixing liquids. Levis, C. R. [trading as Levis Engineering.] **808 070**
Pharmaceutical compositions. Imperial Chemical Industries, Ltd. **808 105**
Polymeric materials. Du Pont de Nemours & Co., E. I. **808 144**
Storage of liquefied gases. Imperial Chemical Industries, Ltd. **807 969**
Method and means for blowing gases possibly carrying pulverulent material into a bath of molten metal. Institut de Recherches de la Siderurgie. 808 145
Substituted androstanes and androstenes and the preparation thereof. Sterling Drug, Inc. **808 225**
Dyestuff intermediates. Imperial Chemical Industries, Ltd., Davies, R. R., and Pearson, K. W. **808 191**
α-(4-Chloro-2 : 3 or 2 : 5-dimethyl-phenoxy) propionic acid and herbicidal compositions containing it. Boots Pure Drug Co., Ltd. **808 106**
Aqueous emulsions of organopolysiloxanes. Farbenfabriken Bayer A.G. **808 193**
Oxidation of sulphur dioxide to sulphur trioxide and catalysts therefor. Imperial Chemical Industries, Ltd. **808 150**
Production of polyvinyl alcohol. Celanese Corp. of America. **808 108**
Electrolytic separation of nickel from cobalt. Soc. Generale Metallurgique de Hoboken. **808 230**
Method of and apparatus for drying liquid substances. Reavell, J. A. **808 153**
Phenothiazine derivatives. Farbenfabriken Bayer A.G. **808 049**
Gas-filtering devices. Preparation Industrielle des Combustibles. [Addition to 700 782.] **807 932**
Apparatus for electromagnetic separation of isotopes. Compagnie Generale de Telegraphie Sans Fil. **808 012**
Production of metallic coatings on the surfaces of metals. Tainton Co. [Addition to 740 075.] **807 933**
Process for preparing 5-chlorosalicyclic acid. General Aniline & Film Corp. **808 155**
Thermostatic mixers for hot and cold liquids. Trubert, R. **808 232**
Process for refining the grain size of hypereutectic aluminium silicon alloys. Aluminium Labs., Ltd. **807 934**
Coating metals with metals. Schweig, B. F. **807 975**
1, 1-Diphenyl-3-dialkylamino-propane, its acid-addition salts, and methods of preparing it. Nederlandsche Combinatie Voor Chemische Industrie N.V., and Laboratoria Pharmaceutica Dr. C. Janssen N.V. **808 158**
Purifying dimethyl terephthalate by distillation. Vereinigte Glanzstoff-Fabriken A.G. **808 089**
Manufacture of nitric acid by catalytic combustion of ammonia. Soc. Belge de l'Azote et des Produits Chimiques du Marly. **808 234**
Therapeutically valuable calcium salts. Farbenfabriken Bayer A.G. **808 093**
Phenthiazine derivatives and processes for their production. Soc. des Usines Chimiques Rhone-Poulenc. **808 239**
Uniting metals to vitreous materials. Standard Telephones & Cables, Ltd. **808 161**
Working up of low-pressure polyolefins. Chemische Werke Hüls A.G. **808 162**
Preparation of Δ^{23}-22-halogen-24 : 24-diphenylcholenes. Organon Laboratories Ltd. **808 245**
Diphenyl-amine derivatives and process for their manufacture. Sandoz, Ltd. **808 112**
Brightening agents. Farbenfabriken Bayer A.G. **808 113**
Conveying the pulverulent and granular material. Fuller Co. **808 098**
Thermal stabilisation of haloethylene polymers. Dow Chemical Co. **808 255**
Aluminium trialkyls and alcohols prepared therefrom. Esso Research & Engineering Co. **808 055**
Removal of pyrogen from pharmaceutical preparations for injection. Organon Laboratories, Ltd. **808 166**
Thiophosphoric acid esters. Farbenfabriken Bayer A.G. **808 259**
Conversion of ethanolanime into ethylene diamine, piperazine and diethylene tramine. Abbey, A. (Dow Chemical Co.). **808 114**
Method of refining aluminium-silicon alloys. Metallgesellschaft A.G. **808 169**
Chemical compounds. Soc des Usines Chimiques Rhone-Poulenc. **807 985**
Pretreatment of metal surfaces which are to be laminated to synthetic resins. Amchem Products, Inc. [Addition to 714 541.] **808 115**
Polyhydric alcohol esters of 2, 2-dichlorobutyric acid and process for preparing same and herbicide and parasiticide composition embodying same. Dow Chemical Co. **808 116**
Ice-colours in textile printing and dyeing. Farbenfabriken Bayer A.G. **808 262**
Photopolymerisable compositions and elements containing same. Du Pont de Nemours & Co., E. I. **807 948**
Preparation of benzene dicarboxylic acids. Bataafsche Petroleum Maatschappij N.V., De. **808 118**
Process for manufacturing furfural. Quaker Oats Co. **808 119**
Quaternary ammonium salts. Arnold, Hoffman & Co., Inc., A. **808 265**
Titanium-base alloys Union Carbide Corp. **808 270**
Barbiturate pharmaceutical preparations. Nicholas Proprietary, Ltd. **808 269**
Method of preparing molten magnesium-base alloy for casting. **807 989**
Manufacture of sulphonylureas. Farbwerke Hoechst A.G. [Divided out of 808 071.] **808 072 & 808 073**
Acyl phenothiazine-10-carboxylic acid esters. Farbenfabriken Bayer A.G. [Divided out of 808 049.] **808 050**

Open to public inspection 4 February

Free-flowing ammonium nitrate. Standard Oil Co. **808 620**
Preparation of aqueous solutions of normally water-insoluble organic substances. Nitritfabrik A.G. **808 272**
Moisture-exchangers for gaseous media. Munters, C. G. **808 411**
Combined heat and moisture exchangers. Munters, C. G. **808 412**
Method and apparatus for manufacturing sheeting, film or film base of organic high polymer material. Kodak, Ltd. **808 343**
Preserving agents for timber and other organic materials. Hager, B. O. **808 277**
Manufacture of bactericidal quaternary ammonium compounds. Rheim-Chemie G.m.b.H. **808 360**
Manufacture of hydrophenanthryl-carboxylic acids and functional derivatives thereof. Ciba Ltd. **808 279**
Process for the heat treatment of an unalloyed or low-alloy structural steel containing from 0.03% to 0.12% of aluminium nitride. Mannesmann A.G. **808 556**
Production of high molecular weight polymers of ethylene. Ruhrchemie A.G. **808 361**
Improvement of fibrous material comprising linear, high-melting polyesters. Farbwerke Hoechst A.G. **808 558**
Substitution products of polymerised olefins. Monsanto Chemical Co. **808 561**
Continuous process for dehydrating liquid or semi-liquid comestible concentrates under sub-atmospheric pressure. Vacu-Dry Co. **808 420**
Metal pigment pastes. English Metal Powder Co., Ltd. **808 313**
Recovery of tetracycline antibiotics from crude fermentation liquors and purified antibiotics resulting therefrom. American Cyanamid Co. **808 362**
Separation of aromatic amines. Tojo, T. **808 425**
Preparing aromatic carboxylic acids and the resulting acids. Bataafsche Petroleum Maatschappij N.V., de **808 566**
Integrated hydration and alkylation of gaseous olefins. Esso Research & Engineering Co. **808 315**
Storage of methyl isopropenyl ketone. Celanese Corp. of America. **808 363**

Publications Received

Drytube Dust Filters: Folder 58. Dallow Lambert and Co. Ltd., Thurmaston, Leicester.
Wavelength Spectrometer. Full description of models D.186 and D.187. Hilger and Watts Ltd., 98 St. Pancras Way, Camden Road, London N.W.1.
Air-Guaging Equipment. New loose-leaf catalogue. Thomas Mercer Ltd., Eywood Road, St. Albans, Herts.
Lab Mill (September 1958). Laboratory mills described. Glen Creston Ltd., 41 Church Road, Stanmore, Middx.
Electricians' Pocket Book: Higgs Motors Ltd., Witton, Birmingham.
Fabrication of Non-ferrous Metals: Cuprocyl Ltd., York Way, King's Cross, London N.7.
Ferranti Mercury Computer: Ferranti Ltd., Hollinwood, Lancashire.
Electric Shot Firing: ICI Nobel Division, Nobel House, Bothwell Street, Glasgow C2.
Laboratory Electrical Furnaces: Pyrometric Equipment Co. Ltd., Unity Works, Market Harborough, Leicestershire.
Measuring and Controlling Nuclear Energy: George Kent Ltd., Luton, Bedfordshire.
Ferranti Pegasus Data-processing System: Ferranti Ltd., Kingsway W.C.2.
Instruments for the measurement and control of temperature, pressure, humidity, volume and flow: Negretti and Zambra Ltd., London W.1. (Available in English, French and Italian).
Chemical and Industrial Stoneware Plant and Containers: Doulton Industrial Porcelains Ltd.
Biological Stains and Staining Methods: British Drug Houses Ltd., Laboratory Chemicals Division, Poole, Dorset.
Plastics Extrusion Equipment: Baker Perkins Ltd., Westwood Works, Peterborough.
Classified Radiographs for Defects in Aluminium Welds: British Welding Research Association. 29 Park Crescent, London W.1.

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.

Acetic Anhydride. Ton lots d/d, £128.

Alum. Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.

Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18.

Ammonia, Anhydrous. Per lb., 1s 9d-2s 3d.

Ammonium Chloride. Per ton lot, in non-ret. pack, £27 to £30 2s 6d.

Ammonium Nitrate. D/d, 4-ton lots, £31.

Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.

Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.

Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 9¼d d/d to 5s 2¾d; golden, 3s ½d d/d per lb. to 4s 5¾d d/d.

Arsenic. Ex-store, £45 to £50.

Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.

Barium Chloride. 2-ton lots, £49.

Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £43.

Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.

Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £68; gran., £46; crystal, £48 10s; powder, £49 10s; extra fine powder, £50 10s; BP, gran., £55 10s; crystal, £57 10s; powder, £58 10s; extra fine powder, £59 10s. Most grades in 6-ply paper bags. £1 less.

Boric Acid. Ton lots, on hessian sacks, c.p. Tech., gran., £76 10s; crystal, £84 10s; powder, £82; extra fine powder £84; BP gran., £89 10s; crystal, £96 10s; powder, £94; extra fine powder, £96. Most grades in 6-ply paper bags, £1 less.

Calcium Chloride. Ton lots, in non-ret. pack; solid and flake, about £15.

Chlorine, Liquid. In ret. 16-17 cwt. drums d/d in 3-drum lots, £40.

Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2¾d.

Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.

Citric Acid. 1-cwt. lots, per cwt., £11 5s. 5 cwt. lots per cwt. £11 ; packed in polythene 1 cwt. lots, per cwt. £10 17s; 5 cwt. lots per cwt. £10 12s.

Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.

Copper Carbonate. Per lb., 2s 3d.

Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £74.

Cream of Tartar. 100%, per cwt., about £11 12s.

Formaldehyde. In casks, d/d, £39 10s.

Formic Acid. 85%, in 4-ton lots, c.p., £89.

Glycerine. Chem. pure, double distilled 1.2627 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £10 1s 6d. Refined Technical grade industrial, 5s per cwt. less than chem. pure.

Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.

Hydrofluoric Acid. 60%, per lb., about 1s 2d.

Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £128 10s; 35% wt., d/d, £158.

Iodine. Resublimed BP, under 1 cwt., per lb., 14s 1d; for 1-cwt. lots, per lb., 13s 2d; 5 cwt., per lb., 12s 8d.

Iodoform. Under 1 cwt., per lb., £1 2s 4d, for 1-cwt. lots, per lb., £1 1s 8d, 5 cwt., per lb., 21s 1d, crystals, 3s more.

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc.

Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.

Lead Acetate. White, about £154.

Lead Nitrate. 1-ton lots, about £135.

Lead, Red. Basis prices: Genuine dry red, £104 5s; orange lead, £116 5s. Ground in oil: red, £125 5s, orange, £137 5s.

Lead, White. Basis prices: Dry English in 5-cwt. casks, £116; Ground in oil: English, 1-cwt. lots, per cwt., 194s.

Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.

Litharge. In 5-ton lots, £106 5s.

Magnesite. Calcined, in bags, ex-works, about £21.

Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.

Magnesium Chloride. Solid (ex-wharf), £17 10s.

Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.

Magnesium Sulphate. Crystals, £16.

Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 1s 9d; smaller quantities dearer.

Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 10s. 6d.

Nickel Sulphate. D/d, buyers UK, nominal, £170.

Nitric Acid. 80° Tw., £35.

Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £129.

Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb., 1s 4d.

Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.

Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £74 10s.

Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.

Potassium Dichromate. Crystal and gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2¼d.

Potassium Iodide. BP, under 1-cwt., per lb., 8s; per lb. for 1-cwt. lots, 7s 3d.

Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.

Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11¼d; 3-cwt. lots, per lb., 1s 10¾d; 5-cwt. lots, per lb., 1s 10¼d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.

Salammoniac. Ton lot, in non-ret. pack, £47 10s.

Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 4d, 1-ton lots.

Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £17 3s.

Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.

Sodium Acetate. Comm. crystals, d/d, £91.

Sodium Bicarbonate. Ton lot, in non-ret. pack, £16 10s.

Sodium Bisulphite. Powder, 60/62%, d/d 2-ton lots for home trade, £46 2s 6d.

Sodium Carbonate Monohydrate. Ton lot, in non-ret. pack, c.p., £57.

Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £88 10s.

Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums. £113 5s.

Sodium Dichromate. Crystals, cake and powder, per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1¾d. Net. del. d/d UK, 5-cwt. to 1-ton lots.

Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.

Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £34 15s.

Sodium Iodide. BP, under 1 cwt., per lb., 13s; 1-cwt. lots, per lb., 12s 9d; 5 cwt., per lb., 12s 3d.

Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.

Sodium Metasilicate. (Spot prices) D/d UK in 1-ton lots, 1-cwt. free paper bags, £27 10s.

Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., per ton £29.

Sodium Nitrite. 4-ton lots, £32.

Sodium Perborate. (10%0) in 1-cwt. free kegs, cwt. lots, £145 15s.

Sodium Percarbonate. 12½% available oxygen, in 1-cwt. kegs, £170 15s.

Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.

Sodium Silicate. (Spot prices) 75-84° Tw. Lancs and Ches., 4-ton lots, d/d station in loaned drums, £11 17s 6d; Dorset, Somerset and Devon, per ton extra, £3 17s 6d; Scotland and S. Wales, extra, £3. Elsewhere in England, not Cornwall, extra, £1 12s 6d.

Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £20.

Sodium Sulphate [Glauber's Salt]. D/d, up to £18 10s.

Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £10 10s.

Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.

Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.

Sulphur. 4 tons or more, ground, according to fineness, £20-£22.

Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £10 10s-£11 12s 6d; 140° Tw., arsenic free, £8 7s 6d; 140° Tw., arsenious, £8 2s 6d.

Tartaric Acid. Per cwt.: 10 cwt. or more, £14 10s; 1 cwt., £14 15s.

Titanium Oxide. Standard grade comm., rutile structure, £178; standard grade comm., anatase structure, £163.

Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £99; green seal, £97; red seal, £94.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128; in 10-gal. drums, £118; in 40-45 gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.

Butyl Acetate BSS. 10-ton lots, £173.

***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £149.

***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-45 gal. drums, under 1 ton, £133; 1-5 tons, £130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125.

tert-Butyl Alcohol. 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.
Diacetone Alcohol. Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148; 1-5 tons, £147; 5-10 tons, £146; 10 tons and over, £145, in 400 gal. tank wagons, £142.
Dibutyl Phthalate. In drums, 10 tons, d/d, per ton, £210; 45-gal. drums, d/d, 1-4 drums, £216.
Diethyl Phthalate. In drums, 10 tons, per ton, £187 10s; 45-gal. drums, d/d, 1-4 drums, £193 10s.
Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £179, 45-gal. drums, d/d, per ton £185.
Dioctyl Phthalate. In drums, 10 tons, d/d, per ton £284; 45-gal. drums, d/d, per ton, £290.
Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.
Ethyl Acetate. 10-ton lots, d/d, £145.
Ethyl Alcohol [PB 66 o.p.]. Over 300,000 p. gal. 4s 0¼d; d/d in tankers, 2,500-10,000 p. gal. per p. gal., 4s 2¾d. D/d in 40/45-gal. drums, p.p.g. extra, 1d. Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.
Methanol. Pure synthetic, d/d, £43 15s.
Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 10½d; 100-499 gal. in drums, d/d, per gal., 6s 3d-6s 5d. Pyridinised 66° o.p.: 500 gal. and up, in tankers, d/d, per gal., 6s 2d; 100-499 gal. in drums, d/d, pet gal., 6s 6½d-6s 8½d.
Methyl Ethyl Ketone. All d/d. In 5-gal. drums, £183; in 10-gal. drums, £173; in 40/45-gal. drums, under 1 ton, £148; 1-5 tons, £145; 5-10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.
Methyl *iso*Butyl Carbinol. All d/d. In 5-gal. drums, £203; in 10-gal. drums, £193; 40-45 gal. drums, less than 1 ton, £168; 1-9 tons, £165; 10 tons and over, £163; in 400-gal. tank wagons, £160.
Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40/45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.
***iso*Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.
***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40/45-gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.
Carbon Black. UKARB-327-7¼d. per lb. ex-works, 3 ton lots, under 3 tons but not less than 1 ton 7½lb ex-works, ex-store, London and Manchester, 8¼d per lb.
Carbon Tetrachloride. Ton lots, £83 15s.
India-Rubber Substitutes. White, per lb., 1s 5¾d to 1s 8d; dark, d/d, per lb., 1s 1½d-1s 5d.
Lithopone. 30%, about £56 10s.
Mineral Black. £7 10s-£10.
Sulphur Chloride. British, about £50.
Vegetable Lamp Black. 2-ton lots, £64 8s.
Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s. 3d; pure, 5s 7d.
Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ¼d. Crude, 60's, per gal., 8s 4d.. MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s 5d.
Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d. MANCHESTER: Per gal., 1s 2d-1s 8d.
Cresylic Acid. Pale 99/100%, per gal., 6s 6d; 99.5/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, from 7s 8d to 9s 3d; per US gallon, c.i.f. NY, 100 to 118.5 cents freight equalised.
Naphtha. Solvent, 90/160°, per gal., 5s. 1d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.
Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65-£66.
Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.
Pyridine. 90/160, per gal., 15s-17s 6d.
Toluole. Pure, per gal., 5s 2d; 90's, d/d, 2,000 gal. in bulk, per gal., 4s 11d. MANCHESTER: Pure, naked, per gal., 5s 6d.
Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 6s 1d-6s 3d.

INTERMEDIATES AND DYES
(Prices Nominal)

***m*-Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.
***o*-Cresol** 30/31°C. D/d, per lb., 1s.
***p*-Cresol** 34/35°C. 10 cwt. lots d/d, per lb. 5s.
Dichloraniline. Per lb., 4s 6d.
Dinitrobenzene. 88/99°C., per lb., 2s 1d.
Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2¼d; SP 66/68°C., per lb., 2s 1d.
***p*-Nitraniline.** Per lb., 5s 1d.
Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots d/d, per lb. 10d.
Nitronaphthalene. Per lb., 2s 5½d.
***o*-Toluidine.** 8-10 cwt. drums (drums extra), per lb., 1s 11d.
***p*-Toluidine.** In casks, per lb., 6s 1d.
Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

TRADE NOTES

Cruickshank-Pennsalt Agreement

R. Cruickshank Ltd., chemical producers and metal finishing specialists, Camden Street, Birmingham, and the Pennsalt International Corporation S.A., have reached an agreement under which R. Cruickshank Ltd. are granted exclusive licence for the manufacture and sale in the U.K. of a wide range of Pennsalt products for the metal industries; also for the sale of these products in certain overseas countries. By agreement with the Pennsalt Chemical Corporation, U.S. licence is also granted to use the Pennsalt trademarks, ensuring the high standard of these products.

Nobel Metal Thermocouples

A second edition of 'Noble Earth Thermocouples', by H. E. Bennett, has been published by Johnson Matthey and Co. Ltd., 73-83 Hatton Garden, London E.C.1. The contents give a comprehensive survey of the development of noble metal thermocouples, applications and methods of callibration. The properties of the platinum group of metals and alloys in relation to the problem of temperature measurement are discussed and information is given on the principal causes of deterioration of thermocouples. Two new sections cover temperature measurement in glass manufacture and in the foundry.

Conveyor-belt Brush Unit

The K.A.M. unit, a development of the Kez-strip conveyor belt brush, manufactured by the Kleen-e-ze Brush Co. Ltd., Bristol, has been cut in price by £15, irrespective of size or type. Rising demand with streamlined production has lowered production costs.

'Fire Protection Year Book'

The 19th edition of the '*Fire Protection Year Book*' is the largest issue of this valuable and unique publication ever produced. Published by Benn Brothers Ltd., who also publish CHEMICAL AGE, the 'Year Book' includes a comprehensive directory of all the public Fire Brigades and Salvage Corps in the British Isles, a directory of industrial and private fire brigades and full details of overseas fire services. Also included are details of civil defence authorities, Government departments and public authorities concerned with fire prevention, and a comprehensive list of suppliers of fire service equipment together with a classified list of such equipment.

Stelvetite Exhibition

An exhibition devoted to the fabrication and applications of Stelvetite, the new plastics-coated steel sheet, is to be held at the Royal Festival Hall, London, from 13 to 16 January, by the manufacturers, John Summers and Sons Ltd., Shotton, Chester. There will be a series of demonstrations including spot welding (which can be done without damage to the p.v.c. coating), high frequency welding, lock forming, printing and drum sealing. Tickets can be obtained on application to the company at Ermin's, Caxton Street, London S.W.1.

G.E.C. and Vacuum Industrial

General Electric Co. have reached an agreement with Vacuum Industrial Applications, whereby the resources of the two companies in the vacuum heating field are combined for the development of vacuum heating techniques together with the design and manufacture of complete vacuum furnace installations. Both companies, by acting jointly, will have good facilities for research, design and manufacture. Under the terms of the agreement inquiries will be handled by G.E.C.

Bornholm Hollow-Blocks

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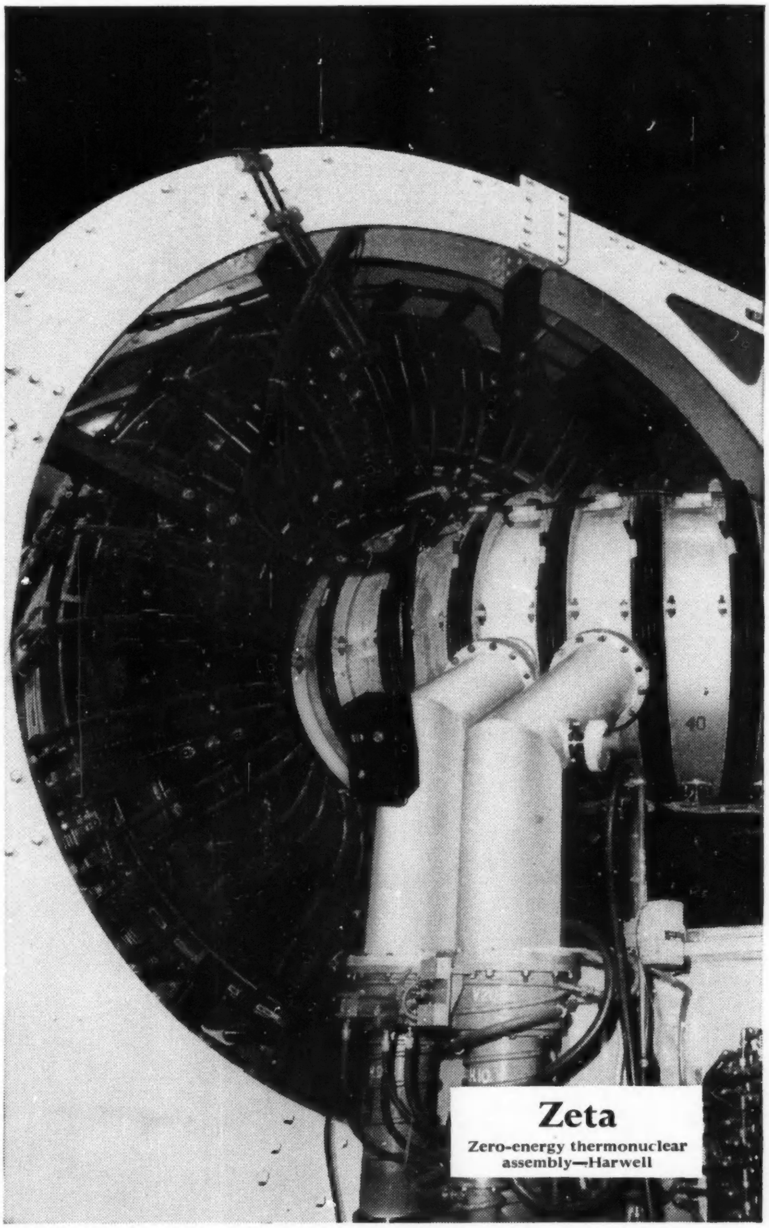

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